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Quantitative Determinations of the Skin Lipid Secretion in Middle-aged and Old Individuals

ESBEN KIRK

USING 234 INDIVIDUALS BETWEEN 19 AND 102 YEARS OF AGE AS SUBJECTS, DR. KIRK CONDUCTED AN INVESTIGATION TO DETERMINE THE LIPID SECRETION OF THE SKIN AND CONCLUDED THAT IT REMAINS RELATIVELY CONSTANT FOR BOTH SEXES UNTIL THE AGE OF 70, AFTER WHICH AGE A DECIDED DIFFERENCE OCCURS.

ALTHOUGH the changes of the skin occurring with age usually are among the most conspicuous geriatric signs, the study of the function of the sebaceous glands in old individuals has received little attention. A perusal of the literature leaves the impression that clinicians in general have been impressed by the dryness and atrophy of the skin occurring in old age and that from this observation a decreased sebaceous secretion has been inferred (24). Histologic studies of the skin of the face do not, however, conform well with this view. Thus several pathologists (26, 27) have observed a hyperplasia of the sebaceous glands in the regions of the forehead and the nose in middle-aged and old individuals, and it has been suggested that the dilated skin pores of the nose and the yellowish color of the face with advancing age might be indicative of such hyperplasia. The hyperplasia does not, however, appear to occur regularly, and in some instances degeneration of the sebaceous glands with age has been noted (8). In view of this conflicting evidence it was considered of interest to study quantitatively the sebaceous secretion in a large group of men and women of various ages with the employment of a reliable experimental and analytic technique. The results of such studies in 234 individuals are reported in the present publication.

PREVIOUS STUDIES ON THE SEBACEOUS SECRETION

Technique of lipid collecting and analysis.—The literature from the period 1900 to 1938 contains several reports of attempts to collect the sebaceous secretion quantitatively by procedures which hardly can be considered adequate, but which nevertheless have yielded results of a certain value. In some of these earlier investigations (1, 10, 20) the technique used consisted of having the subjects wear sets of tight-fitting underwear for periods of days or weeks with subsequent extraction of the lipids from the fabrics with a fat solvent, this procedure permitting an approximate estimation of the lipids secreted from the covered area of the body. In another group of studies the fat secretion from limited areas of the skin was wiped off with dry cotton (22), with cotton swabs moistened with ether or petroleum ether (10, 12, 16), or was absorbed by filter paper closely fitted to the skin surface with adhesive tape (23).

A turning point in the study of the function of the sebaceous glands occurred with

Dr. Esben Kirk is Assistant Professor of Medicine and Director of Research, Division of Gerontology, Washington University School of Medicine. He received his M.D. degree in 1929 from the University of Copenhagen and was certified as a specialist in internal medicine (1938) and clinical pathology (1948). From 1931 to 1934 Dr. Kirk was assistant resident physician at the Rockefeller Institute. From 1936 to 1939 he was on the staff of the medical university clinic and director of the City Laboratories, Copenhagen. From 1939 to 1947 he was chief physician at the medical service, Holstebro County Hospital, Denmark.

His primary fields of research have been in clinical medicine and biochemistry. He is a Member of the American and Danish Gerontological Societies and the Danish Society for Internal Medicine, a Member of the Harvey Society, and a Fellow of the Royal Society of Medicine, England.

the introduction by Emanuel (6) in 1936 of a new technique which permitted a quantitative sampling of the lipids from the skin surface. In Emanuel's procedure the skin area under investigation (2 sq. cm.) was delimited by a glass cylinder, held in position either by means of vacuum in an external glass mantle or by firm pressure of the cylinder edge against the skin surface. Two successive portions of 5 ml. of ether were poured into the cylinder, each portion being left in contact with the skin surface for one minute, after which the ether was syphoned off and the lipids determined by a nephelometric procedure. The pooled ether samples were found to contain the total amount of ether-soluble lipids, as application of a third 5 ml. ether sample to the skin area failed to remove additional fat. The importance of Emanuel's contribution may be seen from the fact that most subsequent investigations have been carried out with methods based on the same principle of lipid sampling (2, 3, 4, 11, 13). A refinement in the technique of the analysis of the lipid samples has recently been introduced by Kvorning (11) and will be described in connection with the report of the results of my investigations.

Factors regulating the sebaceous secretion.—One of the most important features in the mechanism of the skin lipid secretion appears to be the fact that the amount of lipid present on the skin surface 12 to 24 hours after washing the skin with ether closely represents the maximum amount of sebum which is secreted by that skin area (3, 4, 6, 7, 11, 23). This would indicate that the resistance provided by the sebum layer present on the skin surface or in the openings of the glandular ducts constitutes a significant factor in regulating the amount of sebum secreted, the secretion coming to a stop when the resistance balances the secretory pressure of the glands (6, 7). Following mechanical removal of the sebum or removal by treatment of the skin area with ether, the glands immediately resume secretion. The curve representing the amount of sebum secreted during the first twelve or twenty-four hours after removal of the skin lipids with ether has the shape of an asymptotic hyperbola (23), the additional amount of fat secreted in each successive period of time becoming progressively smaller, presumably as a consequence of the progressively increasing resistance against the secretion provided by the already secreted sebum.

The secretion during the first hours after the removal of the sebum is very active. This can be demonstrated by microstereoscopic examination of the skin surface after exposing the skin to osmic acid vapors, by which procedure the formation of black spots in the openings of the ducts may be observed as early as fifteen minutes after washing the skin with ether (3). In the following hours the lipid spreads to the skin sulci radiating from the glandular openings, and finally the area on exposure to osmic acid vapors assumes a more uniform blackened appearance. By chemical analysis it can be shown that the sebum secreted on the forehead during the first fifteen minutes may constitute 25 per cent and after 2 to 4 hours 75 per cent of the total (nearly maximal) amount secreted during a 12 to 24 hour period (6).

The final amount of sebum produced on

the skin surface has been found to be greater in warm than in cold environment (3), a fact which may be caused by a decreased viscosity of the lipids with higher temperature or to an increased blood supply to the skin. The degree of humidity on the other hand appears to be without influence on the amount of sebum secreted in a twenty-four hour period (3).

This mechanism of lipid secretion is generally assumed to be under the influence of a regulating center in the mid-brain and the pons, which normally exerts an inhibiting influence on the activity of the sebaceous glands. Following destruction of the mid-brain in experimental animals (17) and in the presence of extensive lesions of the gray matter in the floor of the third ventricle, the corpus striatum, or in the region of the aqueduct as a result of encephalitis, the sebaceous secretion increases markedly (11, 23). The curve representing the secreted amount of lipids in such patients assumes the form of a straight line (23). The abnormal secretion forms the base for the oily skin frequently observed in patients with residual lesions after encephalitis.

Concerning the effect of peripheral nerves on the skin lipid secretion it has been repeatedly observed that lesions of the nerves to the skin may be associated with a marked increase in the sebaceous secretion (14, 15). In one case reported by Marschalko (14) involving an affection of the supraorbital nerve the layer of lipid material on the skin of the forehead measured 0.5 cm. More extensive studies on the sebum secretion in diseases of the peripheral nerves have been reported by Serrati (23), who found the secretion increased during the active stage of sciatica and trigeminus neuralgia as compared with the unaffected side of the body, but reduced in lesions of longer standing. The mechanism of the abnormal sebaceous secretion in peripheral nerve lesions has not been subjected to closer investigation.

Observations by chemical analyses of the effect of hormone administration on the sebaceous secretion do not appear to have been reported, but such studies are in progress in this division. The increase in sebaceous secretion concomitant with the onset of puberty (see below) would suggest an influence of the sex hormones on the function of the sebaceous glands. This assumption also appears warranted by the results reported by Rony and Zakon (18, 19) who observed a sudden growth and an increase in number of the sebaceous glands of the pubic region in 8 to 9 year old boys, and in the human adult scalp following administration of testosterone and methyl testosterone. Emanuel (6) has examined the lipid secretion of the skin of the forehead in 8 castrated men and 8 women after the menopause, aged 30 to 40 years. The secretion was only about half of that found in normal individuals of the same age group, a finding which is in agreement with the assumption that there exists a correlation between the sex hormones and the skin lipid secretion.

Composition of the sebum.—Investigations on the composition of the normal human sebaceous secretion have been performed by Kvorning (11), using a system of microanalyses, which includes determination of glycerol, total fat, phosphatides, cholesterol, unsaponifiable matter, and free fatty acids in 10 mg. samples of lipid. The results show that triglycerides constitute a little less than half of the sebum, that about 40 per cent are made up of free fatty acids and that 10 to 20 per cent are esters of high molecular alcohols. Cholesterol is present in the latter group and makes up 3 to 4 per cent of the total lipids. Phosphatides were absent in about half of the samples analyzed, and when present constituted less than 3 per cent of the fat. The finding by other investigators (2, 16) of average cholesterol values as high as 7 to 10 per cent can be explained by the fact that the procedure previous to the cholesterol determination did not include a separation of the sebum from cellular debris. As the cholesterol fraction of the lipids in the cells of the epidermis according to Eckstein and Wile (5) may be as high as 13 to 24 per cent, an ad-

mixture of such cells to the sample will result in too high cholesterol values.

The presence of free fatty acids in the human sebaceous secretion has likewise been reported by Rothman, Smiljanic, Shapiro, and Weitkamp (21) who analyzed the fatty material extracted with boiling ether from 45 kg. of human hair swept up from the floors of barber shops in Chicago. The ether soluble material contained 6.6 per cent of free fatty acids. As the sample supposedly contained large amounts of hair cosmetics of lipid nature, the true percentage of free fatty acids in the skin secretion is presumably considerably higher.

Amount of sebum secreted at various parts of the body.—The amount of sebum secreted in a 12 to 24 hour period per square centimeter of the skin surface varies depending on the region of the body. In examination of 95 cutaneous fields in a group of 14 individuals Emanuel (6) found the highest secretion on the forehead (mean value 0.150 mg. per sq. cm. per 24 hours). In the midline of the chest the secretion was somewhat lower (0.130 mg. per sq. cm.), in the epigastrium 0.085, and in the midline of the back 0.075 mg. per sq. cm. In addition the interesting observation was made that the values regularly decreased the farther away from the midline the collections were made. On the extremities the amount of sebum secreted was considerably less than on the forehead and the trunk, the values per sq. cm. ranging between 0.040 and 0.005 mg., regularly decreasing from the proximal to the distal part of the limb. A similar striking difference between the sebaceous secretion on the forehead and on the arm has been reported by Serrata (23).

Constancy of sebaceous secretion in the same individual.—Emanuel (6), Butcher and Parnell (2), and Kvorning (11) studied the variation in the amount of lipid secreted in a twenty-four hour period by the same individual on a certain skin area on different days. They agree that the variation usually is not greater than 10 to 25 per cent. These findings permit the contention of a rather constant lipid secretion in the same person. In Kvorning's series of studies this constancy was noted even in observations performed with intervals as great as six months.

Variations in the sebaceous secretion in different individuals.—The absolute values for the sebaceous secretion may vary considerably between the subjects of the same sex and age group, although the proportion between the amount of sebum secreted at various parts of the body show a fair degree of constancy. A numerical expression of the degree of variation between different individuals may be obtained by a calculation of the coefficient of variation from the figures reported by Emanuel (6) and by Kvorning (11). Thus in 20 young men and women examined by Emanuel the coefficient of variation was 27 and 29 respectively, and in a group of 12 men between the ages of 20 and 30 years studied by Kvorning the coefficient was 26. In a small group consisting of 9 women aged 20 to 40 years a coefficient as great as 47 was noted. Such variations within the same age group are, however, not greater than found in many biologic measurements and do not invalidate comparisons between different age groups or between groups of male and female individuals of the same age.

The effect of age and sex on the skin lipid secretion.—Studies on the effect of age and sex on the sebaceous secretion, a problem which is of special interest in connection with the present publication, have been performed by Emanuel (6) and by Kvorning (11). From the extensive investigations by Emanuel it can be concluded that the secretion in the newborn baby is very high (average 24 hour secretion of the forehead 0.115 mg. per sq. cm.), even when measured one week after the removal of the vernix caseosa.

On the other hand the values obtained in examination of children between the ages of 2 and 12 years (mean value 0.045 mg. per sq. cm.) are only one-third to one-half of those found in adults. Kvorning likewise found low values in children aged 2 to 8 years (mean value 0.080 mg. per sq. cm.). The examination of 6 boys and 5 girls between the ages of 13 and 16 showed a somewhat higher lipid secretion than in the younger children (0.127 mg. per sq. cm.),

but was lower than the average value observed in adults. The boys included in the group all showed beginning growth of beard and the girls had started menstruating. These findings are of interest because, although suggesting an influence of the sex hormones on the skin lipid secretion, they are in contrast with the popular belief of a greatly increased sebaceous secretion in the face during adolescence, an assumption which is probably based on the frequent occurrence of acne in this age group.

Concerning the lipid secretion of the skin of the forehead in adult individuals Emanuel (6) and Kvorning (11) agree that the values on the average are moderately higher in the men than in the women. Emanuel's studies for which individual figures are directly available included 20 young men and 20 young women, presumably under the age of 30. The average skin secretion of the forehead twenty-four hours after washing the face was 0.123 mg. per sq. cm. in the men and 0.094 mg. in the women. Kvorning examined 22 men between the ages of 20 and 52 years and 9 women between 20 and 39 years. A perusal of his analyses reveals only a slight difference between the two sexes. Thus the mean twenty-four hour value found in the men was 0.230 mg. per sq. cm., and in the women 0.206 mg. The four hour secretion values were nearly identical, 0.189 mg. for the men, and 0.176 mg. for the women. Even though the discrepancy between the absolute values reported by Emanuel and Kvorning is quite considerable (probably explained by difference in the procedure used for microanalysis of the lipids) the conclusion seems warranted that newborn babies have a high skin lipid secretion, younger children a low secretion, which as puberty approaches but not quite reaches the adult level, and that in adult individuals the secretion in men tends to be slightly higher than in women.

Kvorning's findings in old individuals deserve special attention in relation to the present investigation, although the group of old subjects examined was relatively small, being composed of 5 men between the ages of 69 and 78 years, and 5 women aged 67 to 73 years. In the old men the mean lipid secretion was approximately the same as found in the younger men, valuing 0.230 mg. per sq. cm. per twenty-four hours, and 0.183 mg. in a four hour period.

In the old women, however, the mean twenty-hour hour value was only 0.109 mg., and the four hour value 0.043 mg. These figures are about one-half and one-fourth respectively of the values found in the younger group. Although inconclusive in view of the small number of individuals studied and the great variation between the subjects the finding assumes importance when considered in connection with the experimental data on old subjects to be presented in this paper.

Present Investigations

Technique.—For the sampling of the lipids from the skin surface and subsequent analysis, the method of Kvorning (11), which constitutes a modification of Emanuel's (6) procedure, was used. The technique was worked out by Kvorning in my hospital division in Denmark during the period 1944 to 1945. Besides analyses of the total lipid content of sebum the present investigations include routine determinations of the cholesterol content of the lipid samples.

Collection of the lipids from the skin surface.—The collection of the skin secretion in all instances was made from a 10 sq. cm. area of the forehead, one collection being performed at 8 a.m. and another four hours later. The individuals subjected to the examination had washed their faces in the ordinary way with soap and water on the previous morning, and on the evening before the test, twelve hours before the first sampling, with water only. They were carefully instructed not to touch the forehead between the two collections. Under these circumstances the amount of lipid present in the first sample will fairly closely represent the maximum amount of fat secreted from that particular skin area, whereas the result of the second sampling will indicate the rate of sebaceous secretion. During the four hour period of the test the room temperature and the relative humidity of the air were recorded.

For sampling of the lipids the individuals were placed prone on a bed with slightly reclined head. A glass cylinder with cut edges, 5 cm. high and with an internal diameter of 3.58 cm., was pressed firmly against the skin of the forehead in the midline, thus delimiting an area of 10 sq. cm. This simple arrangement in nearly all instances provided sufficient contact to prevent leaking of the solvent under the edge of the cylinder. Only in a few subjects an abnormal shape of the forehead or the presence of unusually deep skin furrows prevented the performance of the test. Five ml. of redistilled ethyl ether were then poured into the cylinder and after one minute syphoned off into a small Erlenmeyer flask. To prevent contamination with organic material an all-glass apparatus was used for the transfer; it consisted of a ground glass stopper which fitted into the mouth of the small Erlenmeyer flask and which was perforated by a long and a short bent glass tube. The longer glass tube, tapering at the end, was used for aspiration of the ether from the cylinder, whereas the shorter tube was connected with a piece of rubber tubing for suction. The suction was provided either with the mouth or more conveniently through attachment to a big evacuated glass bottle. Immediately after syphoning off the first portion of ether another 5 ml. portion was poured into the cylinder, and after one minute likewise transferred to the Erlenmeyer flask.

The efficacy of this procedure for quantitative removal of the lipids from a skin area of 10 sq. cm. (5 times larger than in Emanuel's experiments) has been verified by Kvorning (11), who in a third 5 ml. portion of ether applied to the skin surface consistently found less than 0.5 per cent of the total amount of lipids removed by the first two treatments with ether. The pressure of the cylinder against the skin and the effect of the ether on the superficial skin layers leave a white circle surrounded by a red ring which persists for several hours and makes it easy to apply the cylinder to the exact same area of the skin for the lipid sampling four hours after performing the first test.

Evaporation of the solvent. Isolation of the lipids.—The mixed ether sample in the Erlenmeyer flask was transferred to a test tube and the flask rinsed by drawing ether through the collecting apparatus. This rinsing sample was subsequently added to the sample in the test tube. The ether was then evaporated either by leaving the tube at room temperature, carefully protected from dust, or by heating through immersion of the tube in hot water.

The residue after evaporation of the ether consists of lipids, epithelial debris, and a certain amount of water soluble organic and inorganic substances. For isolation of the lipids successive portions of 2 to 3 ml. of petroleum ether, purified as described by Kirk, Page, and Van Slyke (9), were added to the tube and brought to boiling by immersion in warm water in a beaker. The petroleum ether samples were then passed through a small porcelain filter, attached by a ground glass joint to a 25 ml. Erlenmeyer flask provided with a side tube for application of gentle suction. The combined petroleum ether samples were finally made up to 10 ml. in a glass stoppered 10 ml. measuring cylinder.

Determination of total lipids.—For total lipid determination 1 to 2 ml. samples of petroleum ether were transferred to combustion tubes, the solvent evaporated, and the carbon content of the residue determined as described by Van Slyke, Page, and Kirk (25). This method permits the analysis of fat samples of 0.05 to 0.50 mg. with an accuracy of about 1 per cent.

Determination of cholesterol.—The remaining portion of the petroleum ether sample was transferred to a test tube, the petroleum ether evaporated (either at room temperature or by immersion in warm water), and the cholesterol content determined by the Liebermann Burchard reaction. For this analysis 5 ml. of chloroform, 1 ml. of acetic anhydride, and 0.1 ml. of concentrated sulfuric acid were added to the sample, and after careful mixing left for fifteen minutes in the dark for color development. The resulting color was determined by means of a Coleman spectrophotometer No. 14, using a wave length of 625 μμ.

Experimental

Determinations of the total lipid and cholesterol secretion were performed on 116 white men and 94 white women over the age of 40 years, the majority of the subjects being between the age limits 60 to 85 years. For comparison 9 younger white men and 15 younger women were included in the study. The middleaged and older subjects were mostly inmates or patients of the St. Louis City Infirmary and Infirmary Hospital, the younger individuals private volunteers. Patients presenting evidence of skin diseases or suffering from chronic encephalitis, Parkinsonism, hyperthyroidism, myxedema or diabetes, and individuals treated with thyroid, sex hormones, adrenal cortical hormones, iodides, bromides, or atropine preparations were not included in the study. The investigations were limited to the period October 1 to May 15 in order to exclude errors resulting from excessive perspiration caused by warm weather, under which circumstances involuntary wiping of the forehead could hardly be avoided. The average temperature during the tests valued 25.7 C., the mean relative humidity 41 per cent.

The results are reported in tables 1 and 2 and in figure 1.

Total lipid secretion.—The data presented in table 1 and 2 and in figure 1 show that the total amount of lipid secreted in a twelve hour period is approximately the same in the men and the women until the age of 70. After this age the sebaceous secretion remains high in the men and even shows a tendency to increase, whereas the values for the women in the age groups 70 to 100 years are much lower than those found in the men. Thus the twelve hour sebaceous secretion in the women between 70 and 80 years was only half of that observed in the men, and in the women above 80 little more than one-third of the male values. *These findings permit the conclusion of a significant sex difference in the skin fat secretion of old men and women.*

The results representing the four hour sebum secretion show essentially the same trend as the twelve hour determinations, the secretion in the old men being much higher

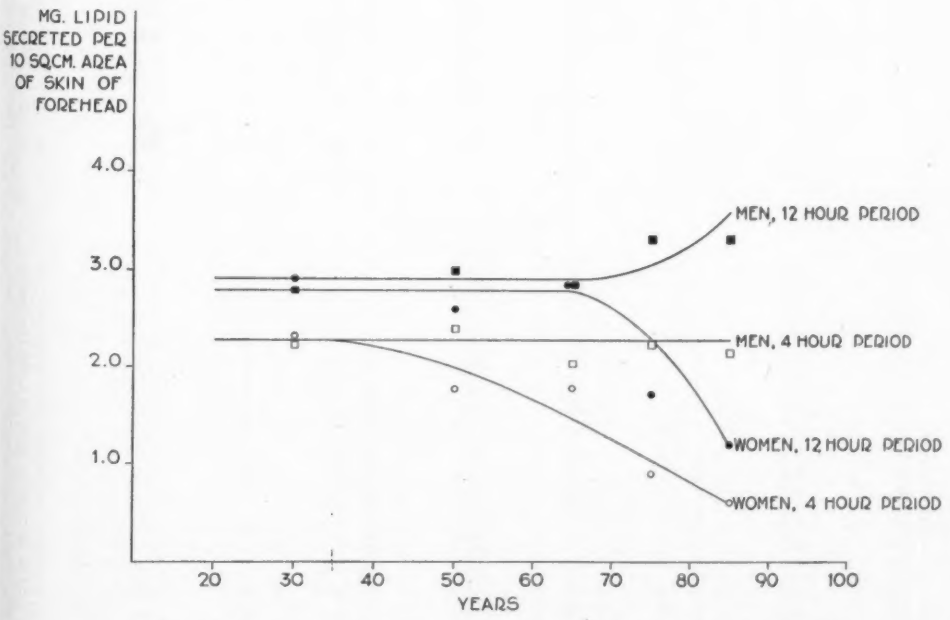

Fig. 1. Total lipid secretion on 10 sq. cm. area of skin of forehead (234 individuals).

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
Men 16-39 years								
1.	20	2.06	0.69	34	0.031	1.5	0.010	2.1
2.	24	3.09	3.31	110	0.076	2.5	0.079	2.5
3.	30	2.50	1.46	59	0.015	0.6	0.031	2.1
4.	32	4.20	2.52	60	0.086	2.0	0.071	2.8
5.	32	3.36	1.93	58	0.049	1.5	0.031	1.6
6.	34	2.44	1.67	69	0.052	2.1	0.040	2.4
7.	36	2.12	2.96	140	0.012	0.6	0.036	1.2
8.	36	1.52	1.71	112	0.076	5.0	0.073	4.3
9.	38	3.82	3.88	101	0.095	2.5	0.074	1.9
	Mean	2.80	2.24	83	0.054	2.0	0.049	2.3
	s.d.	0.84	0.95		0.031		0.023	
Men 40-59 years								
10.	41	2.55	3.54	138	0.082	3.2	0.075	2.1
11.	42	1.40	1.50	107	0.012	0.9	0.012	0.8
12.	44	3.26	2.05	63	0.034	1.0	0.029	1.4
13.	50	2.30	1.20	52	0.086	3.7	0.057	4.8
14.	54	7.25	4.55	63	0.180	2.5	0.096	2.1
15.	56	2.96	1.98	67	0.045	1.5	0.108	5.5
16.	56	2.90	1.95	67	0.122	4.2	0.082	4.2
17.	56	1.61	2.85	176	0.090	5.4	0.043	1.5
	Mean	3.03	2.45	91	0.081	2.8	0.063	2.8
	s.d.	1.70	1.05		0.050		0.033	
Men 60-69 years								
18.	60	1.70	0.70	41	0.128	7.5	0.070	10.0
19.	61	3.40	1.87	55	0.053	1.6	0.029	1.6
20.	61	2.46	1.06	43	0.079	3.2	0.039	3.7
21.	62	1.61	1.24	77	0.038	2.4	0.031	2.5
22.	62	1.50	2.30	153	0.090	6.0	0.134	5.8
23.	62	3.62	0.76	21	0.146	4.0	0.032	4.2
24.	62	2.10	1.40	67	0.066	3.1	0.050	3.6
25.	62	1.39	0.62	45	0.049	3.5	0.033	5.3
26.	63	1.43	1.63	114	0.067	4.7	0.064	3.9
27.	63	3.78	2.36	63	0.092	2.4	0.053	2.3
28.	63	7.57	4.68	62	0.086	1.1	0.075	1.6
29.	63	3.40	1.10	32	0.140	4.1	0.055	5.0
30.	63	0.57	1.31	230	0.016	2.8	0.038	2.9
31.	64	4.15	7.00	169	0.092	2.2	0.128	1.8
32.	65	2.10	3.06	145	0.083	3.9	0.047	1.5
33.	65	1.80	0.80	44	—	—	—	—
34.	65	4.18	5.84	139	0.065	1.6	0.100	1.7

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
				Men 60-69 years—Continued				
35.	66	2.10	1.84	88	0.002	0.1	0.000	0.0
36.	67	3.90	2.10	54	0.148	3.8	0.082	3.9
37.	67	0.50	1.20	240	0.037	7.4	0.053	4.4
38.	67	2.02	1.92	94	0.068	3.4	0.075	3.9
39.	67	2.32	2.12	91	0.059	2.5	0.052	2.5
40.	67	7.44	2.72	37	0.250	3.4	0.086	3.2
41.	68	1.96	1.88	96	0.027	1.4	0.012	0.6
42.	68	3.06	1.80	59	0.133	4.4	0.060	3.3
43.	69	3.88	1.41	36	0.150	3.9	0.035	2.5
44.	69	3.97	3.81	96	0.100	2.5	0.055	1.4
45.	69	3.71	2.18	59	0.085	2.3	0.060	2.8
46.	69	3.26	1.85	57	0.097	3.0	0.058	3.1
47.	69	3.32	2.34	71	0.057	1.7	0.022	0.9
48.	69	3.14	1.32	42	0.054	1.7	0.000	0.0
49.	69	3.37	2.02	60	0.077	2.3	0.052	2.6
50.	69	1.18	0.39	33	0.065	5.5	0.020	5.2
51.	69	1.00	0.90	90	0.066	6.6	0.048	5.3
	Mean	2.84	2.05	83	0.084	3.4	0.053	3.1
	s.d.	1.57	1.40		0.047		0.031	
				Men 70-79 years				
52.	70	3.90	2.98	77	0.125	3.2	0.088	3.0
53.	70	3.70	2.80	76	0.150	4.1	0.086	3.1
54.	70	1.41	0.76	54	0.050	3.5	0.021	2.8
55.	70	1.57	1.74	111	0.042	2.7	0.067	3.9
56.	71	2.88	2.47	86	0.070	2.4	0.072	2.9
57.	71	5.05	4.00	79	0.125	2.5	0.123	3.1
58.	71	5.94	—	—	0.118	2.0	0.081	—
59.	71	2.42	2.42	100	0.088	3.6	0.086	3.6
60.	71	7.60	6.04	80	0.142	1.9	0.103	1.7
61.	72	3.10	2.40	78	0.118	3.8	0.081	3.4
62.	72	6.36	4.28	67	0.260	4.1	0.160	3.8
63.	73	3.83	2.55	68	0.067	1.8	0.047	1.8
64.	73	4.00	3.52	88	0.086	2.1	0.079	2.2
65.	73	2.76	2.30	84	—	—	0.070	3.0
66.	73	2.22	1.40	64	0.059	2.7	0.029	2.1
67.	73	3.22	2.18	68	0.103	3.2	0.049	2.2
68.	74	1.50	0.60	40	0.057	3.8	0.047	7.9
69.	74	2.88	1.42	49	0.060	2.1	0.028	2.0
70.	74	2.20	1.90	86	0.100	4.6	0.077	4.1
71.	74	2.12	1.32	63	0.097	4.6	0.050	3.8
72.	74	2.63	2.51	96	0.061	2.3	0.056	2.2
73.	75	4.81	2.79	58	0.130	2.7	0.090	3.2
74.	75	3.87	2.10	54	0.116	3.0	0.066	3.1

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
Men 70-79 years—Continued								
75.	76	2.20	1.90	86	0.105	4.8	0.063	3.3
76.	76	3.58	1.86	52	0.104	2.9	0.056	3.0
77.	76	2.30	1.84	80	0.033	1.4	0.038	2.1
78.	76	4.54	2.35	52	0.104	2.3	0.048	2.0
79.	76	5.54	3.00	54	0.123	2.2	0.064	2.1
80.	76	2.36	1.04	44	0.076	3.2	0.027	2.6
81.	77	4.74	3.83	81	0.114	2.4	0.095	2.5
82.	77	2.12	1.75	83	0.086	4.1	0.069	3.9
83.	77	2.76	1.07	39	0.136	4.9	0.052	4.9
84.	78	2.94	2.15	73	0.098	3.3	0.070	3.2
85.	78	3.22	2.59	80	0.094	2.9	0.050	1.9
86.	78	5.20	2.80	54	0.055	1.1	0.031	1.1
87.	78	2.82	2.11	75	0.059	2.1	0.035	1.7
88.	78	1.68	1.62	97	0.053	3.2	0.013	0.8
89.	79	1.70	0.80	47	0.061	3.6	0.023	2.9
90.	79	2.50	1.40	56	0.108	4.3	0.065	4.6
91.	79	2.95	0.90	30	0.073	2.5	0.046	5.1
	Mean	3.34	2.24	69	0.076	3.0	0.063	3.0
	s.d.	1.40	1.05		0.033		0.030	
Men above 80 years								
92.	80	2.50	1.28	51	0.086	3.4	0.050	3.9
93.	80	2.39	2.02	85	0.076	3.2	0.052	2.6
94.	80	0.80	0.25	31	0.086	10.8	0.073	29.0
95.	80	2.63	2.28	87	0.043	1.6	0.017	0.7
96.	81	1.80	1.10	61	0.064	3.6	0.070	6.3
97.	81	2.54	—	—	0.071	2.8	—	—
98.	81	3.83	2.72	71	0.111	2.9	0.072	2.6
99.	81	2.71	2.12	78	0.083	3.1	0.067	3.1
100.	81	5.38	1.12	21	0.167	3.1	0.032	2.9
101.	82	4.44	1.29	29	0.710	16.0	0.035	2.7
102.	82	2.19	1.37	63	0.045	2.1	0.039	2.8
103.	82	3.53	2.43	69	0.072	2.1	0.043	1.8
104.	82	4.47	2.39	54	0.153	3.4	0.084	3.9
105.	83	2.65	1.74	66	0.077	2.9	0.047	2.7
106.	83	2.44	3.19	131	0.062	2.5	0.093	2.9
107.	83	2.14	1.25	58	0.044	2.1	0.022	1.7
108.	83	4.25	3.79	89	0.085	2.0	0.065	1.7
109.	84	4.61	2.70	59	0.091	2.1	0.031	1.2
110.	84	6.35	4.42	70	0.152	2.4	0.086	1.9
111.	84	3.86	2.74	71	0.056	1.5	0.033	1.2
112.	85	4.71	3.82	81	0.150	3.2	0.106	2.9
113.	85	2.12	1.68	79	0.066	3.1	0.037	2.2
114.	86	4.04	2.48	62	0.072	1.8	0.050	2.0

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
Men above 80 years—Continued								
115.	86	7.04	5.70	81	0.258	3.7	0.155	2.7
116.	86	3.14	1.77	57	0.160	5.1	0.061	3.4
117.	87	2.70	2.10	78	0.108	4.0	0.061	2.9
118.	87	3.82	2.17	57	0.097	2.5	0.067	3.1
119.	88	2.15	1.49	70	0.038	1.8	0.015	1.0
120.	88	1.87	0.60	32	0.062	3.3	0.025	4.2
121.	88	3.40	2.90	85	0.127	3.7	0.108	3.7
122.	89	1.14	0.62	54	0.040	3.5	0.013	2.1
123.	91	5.20	3.58	69	0.180	3.5	0.127	3.6
124.	99	2.32	0.59	25	0.043	1.9	0.020	3.4
125.	102	2.78	1.28	46	0.100	3.6	0.042	3.3
	Mean	3.30	2.15	62	0.110	3.5	0.058	3.5
	s.d.	1.40	1.16		0.114		0.034	
Women 16-39 years								
126.	19	2.80	2.23	80	0.072	2.5	0.044	2.0
127.	21	3.81	2.48	65	0.115	3.0	0.059	1.5
128.	22	4.78	5.18	108	0.053	1.1	0.010	0.2
129.	24	2.61	1.65	63	0.050	1.9	0.030	1.8
130.	25	2.61	1.44	55	0.075	2.9	0.050	3.5
131.	25	3.64	3.04	84	0.075	2.1	0.012	0.4
132.	26	1.23	0.67	55	0.016	1.3	0.012	1.8
133.	30	1.56	1.42	91	0.046	3.0	0.043	3.0
134.	31	2.52	1.82	72	0.056	2.2	0.028	1.5
135.	32	1.54	0.85	55	0.070	4.5	0.054	6.3
136.	33	3.00	1.40	47	0.077	2.6	0.055	3.9
137.	35	6.38	3.31	52	0.112	1.8	0.072	2.2
138.	35	2.28	3.33	146	0.030	1.3	0.034	1.0
139.	36	1.90	1.46	77	0.042	2.2	0.036	2.5
140.	38	4.73	4.15	88	0.018	0.4	0.081	2.0
	Mean	3.02	2.30	76	0.061	2.2	0.042	2.3
	s.d.	1.34	1.23		0.029		0.022	
Women 40-59 years								
141.	42	3.20	5.58	174	0.075	2.3	—	—
142.	43	2.30	2.02	88	0.037	1.6	0.030	1.5
143.	44	5.02	2.94	59	0.125	2.5	0.052	1.8
144.	47	1.82	0.65	36	0.102	5.6	0.043	6.6
145.	48	3.60	2.20	61	0.102	2.8	0.100	4.6
146.	50	3.03	1.79	59	0.081	2.7	0.059	3.4
147.	51	1.06	1.04	97	0.041	3.9	0.020	1.9
148.	53	1.57	2.43	154	0.020	1.3	0.005	0.2

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
				Women 40-59 years—Continued				
149.	53	1.41	1.64	115	0.065	4.6	0.056	3.4
150.	53	1.36	0.94	69	0.053	3.9	0.034	3.6
151.	54	7.50	1.67	22	0.049	6.5	0.037	2.2
152.	54	0.73	0.52	71	0.039	5.3	0.032	6.2
153.	55	2.98	1.85	62	0.093	3.1	0.072	3.9
154.	57	2.40	1.30	54	0.108	4.5	0.066	5.1
155.	57	3.30	1.60	49	0.164	5.0	0.075	4.7
156.	57	1.66	1.51	91	0.059	3.6	0.042	2.8
157.	58	1.60	0.79	49	0.034	2.1	0.000	0.0
158.	59	2.60	1.50	58	0.104	4.0	0.059	3.9
159.	59	2.12	1.53	72	0.076	3.6	0.060	3.9
	Mean	2.59	1.76	76	0.075	3.7	0.047	3.3
	s.d.	1.53	1.08		0.036		0.024	
				Women 60-69 years				
160.	60	1.96	1.39	71	0.056	2.9	0.050	3.6
161.	61	1.32	0.74	56	—	—	0.030	4.1
162.	63	2.72	1.69	62	0.032	1.2	0.025	1.5
163.	63	0.50	0.10	20	0.003	0.6	0.003	3.0
164.	64	2.74	2.61	96	0.090	3.3	0.077	3.0
165.	64	3.60	1.71	48	0.120	3.3	0.042	2.5
166.	64	0.27	0.14	52	0.036	13.3	0.012	8.6
167.	64	1.78	1.22	68	0.051	2.9	0.016	1.3
168.	64	5.54	1.49	27	0.080	1.4	0.030	2.0
169.	64	8.92	5.28	59	0.197	2.2	0.105	2.0
170.	65	1.43	0.66	46	0.044	3.1	0.030	4.6
171.	66	1.36	1.00	73	0.031	2.3	0.027	2.7
172.	66	0.94	0.61	65	0.159	18.0	0.085	13.9
173.	67	8.05	5.72	71	0.122	1.5	0.085	1.5
174.	68	1.51	0.84	56	0.067	4.4	0.031	3.7
175.	68	2.80	1.25	45	0.102	3.6	0.039	3.1
176.	69	3.43	2.65	78	0.096	2.8	0.070	2.6
	Mean	2.88	1.76	59	0.080	4.2	0.045	3.7
	s.d.	2.40	1.53		0.050		0.032	
				Women 70-79 years				
177.	70	0.25	0.25	100	0.025	10.0	0.020	8.0
178.	70	1.70	0.60	35	0.081	4.8	0.039	6.5
179.	70	1.65	0.94	57	0.059	3.6	0.028	3.0
180.	71	1.71	0.58	34	0.074	4.3	0.040	6.9
181.	71	1.85	1.09	59	0.085	4.6	0.030	2.7
182.	71	1.53	0.88	58	0.056	3.7	0.031	3.5

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
Women 70-79 years—Continued								
183.	71	0.54	0.22	41	0.002	0.4	0.000	0.0
184.	72	1.10	0.70	64	0.066	6.0	0.022	3.2
185.	72	0.61	0.24	39	0.049	8.0	0.018	7.5
186.	73	2.00	1.70	85	0.120	6.0	0.090	5.3
187.	73	1.77	0.81	46	0.091	5.1	0.040	5.0
188.	73	0.61	0.14	23	0.031	5.0	0.012	8.5
189.	73	1.21	0.52	43	0.070	5.8	0.038	7.3
190.	73	0.72	0.42	58	0.062	8.6	0.023	5.5
191.	73	1.18	0.70	59	0.042	3.6	0.017	2.4
192.	74	1.70	0.60	35	0.093	5.5	0.045	7.5
193.	74	3.30	3.30	100	0.083	2.5	0.060	1.8
194.	74	3.76	3.00	80	0.106	2.8	0.073	2.4
195.	74	1.09	0.74	68	0.012	1.1	0.000	0.0
196.	75	0.99	0.52	53	0.037	3.7	0.022	4.2
197.	76	0.87	0.26	30	0.044	5.1	0.017	6.5
198.	76	3.00	0.40	13	0.061	2.0	0.040	10.0
199.	76	0.40	0.10	25	0.061	15.0	0.046	46.0
200.	76	2.58	2.10	81	0.045	1.7	0.016	7.6
201.	77	1.73	1.03	60	0.049	2.8	0.014	1.4
202.	77	2.14	0.93	43	0.080	3.7	0.037	4.0
203.	77	0.46	0.30	65	0.026	5.7	0.012	4.0
204.	79	1.40	0.45	32	0.090	6.4	0.043	9.6
205.	79	3.94	1.25	32	0.090	2.3	0.040	3.2
206.	79	3.90	2.80	72	0.120	3.1	0.090	3.2
	Mean	1.66	0.92	53	0.064	4.8	0.034	6.3
	s.d.	1.03	0.83		0.030		0.022	
Women above 80 years								
207.	80	3.44	1.40	41	0.143	4.2	0.052	3.7
208.	80	1.00	0.30	30	0.106	10.6	0.058	19.3
209.	80	0.80	0.20	25	0.040	5.0	0.040	20.0
210.	80	0.60	0.20	33	0.037	6.2	0.026	13.0
211.	80	4.70	3.15	67	0.108	2.3	0.054	1.7
212.	80	1.10	0.90	82	0.077	6.3	0.043	4.8
213.	81	0.50	0.20	40	0.038	7.6	0.024	12.0
214.	81	1.60	0.50	31	0.080	5.0	0.050	10.0
215.	81	2.04	0.79	39	0.067	3.3	0.000	0.0
216.	82	0.58	0.33	57	0.041	7.1	0.025	7.6
217.	82	0.50	0.20	40	0.050	10.0	0.033	16.5
218.	83	0.89	0.93	104	0.035	3.9	0.033	3.6
219.	83	1.39	0.54	39	0.043	3.1	0.037	6.9
220.	83	1.41	0.59	42	0.020	1.4	0.006	1.0
221.	83	0.80	0.10	13	0.040	5.0	0.020	20.0
222.	84	1.50	0.50	33	0.162	10.8	0.092	18.4
223.	84	0.40	0.10	25	0.040	10.0	0.020	20.0

TABLE 1. THE TOTAL LIPID AND CHOLESTEROL SECRETION ON A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 234 INDIVIDUALS—Continued

No.	Age	Total lipid secretion			Cholesterol secretion			
		12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	In percentage of total lipids	4 hour period	In percentage of total lipids
	Years	mg.	mg.		mg.		mg.	
				Women above 80 years—Continued				
224.	85	0.78	0.18	23	0.038	4.9	0.016	8.9
225.	86	1.30	0.20	15	0.060	4.6	0.007	3.5
226.	86	0.90	0.50	56	0.058	6.4	0.044	8.8
227.	86	2.30	1.90	83	0.076	3.3	0.051	2.7
228.	86	0.60	0.10	17	0.026	4.3	0.012	12.0
229.	87	0.71	0.14	20	0.030	4.2	0.008	5.7
230.	89	1.10	0.70	64	0.055	5.0	0.038	5.4
231.	90	0.80	0.55	69	0.057	7.1	0.020	4.7
232.	91	0.45	0.19	42	0.019	4.2	0.021	11.0
233.	92	1.08	0.96	87	0.055	5.1	0.028	2.9
234.	101	1.16	0.65	56	0.065	5.6	0.065	10.0
	Mean	1.23	0.61	46	0.059	5.6	0.033	9.1
	s.d.	0.91	0.65		0.033		0.020	

TABLE 2. SUMMARY OF MEAN TOTAL LIPID AND CHOLESTEROL SECRETION VALUES FROM A 10 SQ. CM. SKIN AREA OF THE FOREHEAD IN 125 MEN AND 109 WOMEN

Total lipid secretion

Age group	Men			Women		
	12 hour period	4 hour period	4 hour period in percentage of 12 hour period	12 hour period	4 hour period	4 hour period in percentage of 12 hour period
	mg.	mg.		mg.	mg.	
16-39	2.80	2.24	83	3.02	2.30	76
40-59	3.03	2.45	91	2.59	1.76	76
60-69	2.84	2.05	83	2.88	1.76	59
70-79	3.34	2.24	69	1.66	0.92	53
Above 80	3.30	2.15	62	1.23	0.61	46

Cholesterol secretion

Age group	Men		Women	
	12 hour period mg.	4 hour period mg.	12 hour period mg.	4 hour period mg.
16-39	0.054	0.049	0.061	0.042
40-59	0.081	0.063	0.075	0.047
60-69	0.084	0.053	0.080	0.045
70-79	0.076	0.063	0.064	0.034
Above 80	0.110	0.058	0.059	0.033

than in the old women. For the individuals above 80 the proportion between the two sexes is as great as 3:1. It will be seen from table 2 and figure 1 that the four hour secretion in the men remains remarkably constant from youth to old age, whereas the values found in the old women on the average are only about one-fourth of those observed in young women. As further seen from table 1 and 2 the rate of secretion, expressed as the percentage of the four hour secretion of the twelve hour (presumably maximal) value, decreases definitely in the women after the age of 60. It is possible that the slow rate of secretion observed in older women (or, expressed in other words, the flatter secretion curve), to some extent may account for the low twelve hour values found, so that in the older women a longer period than twelve hours is required for establishing the maximum amount of sebum on the skin surface. Such explanation would, however, hardly suffice to explain fully the very great difference found between the old men and the old women.

A comparison of the absolute values found for the total lipid secretion in young and middle-aged individuals in this study and in the investigations reported by Emanuel and by Kvorning shows that the figures presented in this publication are two to three times as great as those found by Emanuel, and about 30 per cent higher than those observed by Kvorning. It seems reasonable to assume, as previously discussed, that the difference in the analytic technique employed can explain the discrepancy between Emanuel's values on one side and the results of Kvorning's investigations and of the present studies on the other side. The cause for the 30 per cent higher values found in this investigation as compared with Kvorning's figures calls for another explanation, as both investigations were performed with identical technique. The most likely reason for the higher values found in this study is the rather high environmental temperature under which the present investigations were conducted (25.7° C.), whereas Kvorning's tests were made in the colder room temperature prevailing in Danish institutions. In this connection it should be recalled that an increased sebaceous secretion with higher temperature was demonstrated in the investigations by Butcher and Parnell (3). Apart from the moderately higher values found in the present studies the results agree closely with Kvorning's observations in the fields covered by both investigations.

Cholesterol secretion.—The cholesterol secretion values observed in men and women of various ages (see table 1 and 2) show a similar but less marked difference between the two sexes, thus supporting the conclusion stated above. As seen from table 1 the cholesterol *percentage* of the total skin lipids is rather high in the sebaceous samples collected from the women in the age groups 70 to 79 years and above 80 years, the mean values for these groups ranging between 4.8 and 9.3 per cent. For the remaining 176 individuals, including all the men, and the women from 16 to 69 years, the average cholesterol value was 3.2 per cent for the twelve hour period and 3.0 per cent for the four hour period. The latter values agree closely with those observed by Kvorning in analysis of the various lipid fractions of the skin fat in a limited number of subjects, but are much lower than the percentage values of 9 to 10 reported by Butcher and Parnell (2). As suggested previously in this paper the difference is probably explainable by the omission of Butcher and Parnell to separate the epithelial cells in the samples from the free skin lipids. That a certain extraction of cholesterol from the superficial epithelial cells of the skin also occurs with the method of lipid sampling employed in the present investigations is, however, suggested by the above mentioned finding of higher percentage cholesterol values in the samples collected from the old women, the rise in the cholesterol percentage being concomitant with the decrease in the total lipid content of these samples.

Summary

In a study of 234 individuals between the ages of 19 and 102 years approximately the same twelve hour sebaceous secretion was

noted in both sexes until the age of 70. Above this age a significant sex difference in the skin fat secretion was found, the mean twelve hour secretion in the women being only one-half (70 to 79 years) and one-third (above 80 years) of that observed in the men, in whom the secretion showed a moderate tendency to increase with old age. In agreement with this the four hour sebaceous secretion, indicating the secretory rate, showed great constancy from youth to old age in the men, whereas the secretion in the old women was only one-fourth of that observed in young women.

The skin cholesterol secretion showed a similar, but less marked difference between the two sexes.

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The author's address is:
Dr. Esben Kirk
Division of Gerontology, Washington University School of Medicine
5600 Arsenal Street, St. Louis 9, Missouri

Age Changes in the Light Threshold of the Dark Adapted Eye

JAMES E. BIRREN, MALCOLM W. BICK,
AND CHARLOTTE FOX

EXAMINATION OF 130 MALE INDIVIDUALS BETWEEN THE AGES OF 18 AND 83 YEARS INDICATED A SIGNIFICANT DECLINE WITH AGE IN THE SENSITIVITY OF THE DARK ADAPTED EYE. THE DECLINE WAS MOST MARKED IN SUBJECTS BEYOND THE AGE OF 60, AN AGE RANGE NOT COVERED ADEQUATELY IN PREVIOUS STUDIES.

STUDIES of dark adaptation have frequently included observations on age changes incidental to investigations of other factors. Conflicting reports have indicated no age change (1, 6, 8), little change (3, 12) or significant change (9, 10, 13, 14). Consideration of the literature reveals several factors which may be involved in studies of aging of this function.

The variable treated most quantitatively has been pupil size. Sloan (11) clearly showed that the amount of light reaching the retina is directly proportional to pupil size and that it is valid to convert thresholds to a standard pupil size. Robertson and Yudkin (9) applied such a correction factor to their data and concluded that all the manifest age changes in the minimum light threshold were due to diminished pupil size in the elderly. They have thus eliminated by this conclusion the possibility of other processes affecting dark adaptation during the life span.

Instrumental errors may also be of sufficient magnitude to obscure any age change. Hunt and Palmer (4) analyzed sources of error in a quantitative manner and concluded that all "neutral" filters used in dark adaptometers should be made of glass because of deterioration of gelatin-between-glass filters. They further recommended that commercially available chromatic glass filters be checked since the original calibrations may contain errors within the range of individual differences of subjects' light thresholds. An additional source of error lies in the voltage applied to the incandescent light source. A change of 10 volts will produce a change of 100° K in the lamp or about 0.05 unit of density. For this reason, lamps used without voltage regulators are subject to brightness variations.

The study of Robertson and Yudkin (9) contained observations on only 7 individuals above the age of 65, one of whom was above 70. The lack of adequate numbers of elderly persons in this and other studies (3, 7, 8, 9, 13) necessitates further work before conclusions may be drawn with respect to aging.

Proper attention has not been given to interpretation of results as they may be affected by socio-economic factors in subject selection. Investigators studying only industrial personnel of different ages have to consider the attentuation that occurs in the population of elderly workers, such as that the infirm have no chance to be represented in the study. In the case of young and middle-aged subjects, industrial sampling is probably a reasonable manner of estimating the distribution of many traits in the total population. The limited number of elderly who are employed are, in a sense, atypical individuals and therefore age changes might be minimized in studies of such a group.

Similarly, age changes are minimized by attempts to eliminate all persons with pathologic conditions from investigations of the

Dr. Birren received his M.A. degree in psychology in 1942 and his Ph.D. in 1947 from Northwestern University. From 1943 to 1946 he was a research psychologist at the Naval Medical Research Institute. He was appointed research fellow of the National Institute of Health in 1946-1947 and in 1947 accepted his present appointment as research psychologist in the Gerontology Section of the National Institutes of Health, U.S.P.H.S.

Dr. Bick received his A.B. degree at Yale in 1936 and his M.D. in 1940 at Harvard. After a two-year rotating internship and service in the Army, he was appointed house officer and assistant resident in ophthalmology at Johns Hopkins Hospital and also the Baltimore City Hospitals in 1945. He was appointed research fellow at the Wilmer Eye Institute in 1948.

Miss Fox received her B.S. degree in psychology in 1946 and her M.A. in 1947, both at Northwestern University, and has done graduate study at Johns Hopkins. She served as student psychologist at Elgin and Chicago State Hospitals and was appointed as research psychologist in the Gerontology Section of the National Institutes of Health, U.S.P.H.S. in 1947.

aged. There is, at the moment, no reasonable hypothesis nor valid method for separating increased incidence of ocular pathology in the aged from the aging process itself. A separate analysis is being made of the effects of individual pathologic processes on the light threshold of the subjects in the present study.

Procedure

A Hecht Shlaer adaptometer (2) was used in all threshold measurements. The test field was circular 3°, exposed with violet light (below 460 $\mu\mu$, Corning 511) for 0.2 sec., and lay 7½° nasal to the fixation point, i.e., the temporal retina was stimulated. The light source used in this instrument was an incandescent lamp operated at 115 volts maintained by a voltage regulator. Lamp calibrations were made with a Macbeth Illuminometer. All filters including the variable density wedge were glass, previously calibrated at the National Bureau of Standards for spectral transmission and density for incandescent-lamp light.

Each subject was instructed individually before dark adaptation. The subject was seated before the instrument and the chin rest was adjusted to center the subject's eye in the eye piece of the adaptometer. The fixation point was indicated to the subject and he was told to keep his eye upon this spot during the measurements and instructed that failure to do so would prevent him from seeing the flashes of light. Sample flashes of decreasing brightness were then presented to acquaint the subject with the nature of the flashes. A signal of "yes" or "no" was used to indicate seeing and non-seeing of the flash.

Light thresholds were measured after three minutes of light adaptation at a brightness of 479 ml. (11.68 log. micro micro lamberts). Measurements were made at one minute intervals for the first ten minutes after pre-exposure to bright light and at two minute intervals thereafter until thirty minutes had elapsed. The mean of the last two determinations was used as the subject's threshold.

Threshold measurements were made in a descending manner, i.e., from a perceptible stimulus to a non-perceptible stimulus, for the first twenty minutes. During subsequent measurements the threshold was approached alternately from above and below to assure maximum reliability during the final phase of adaptation.

Reliability of measurements with the present adaptometer had been well established by Hunt and Palmer (4). Retest measurements on 44 of the subjects in the present study yielded a correlation of 0.87. None of the subjects was retested on the same day. Correlation of threshold values at twenty-eight and thirty minutes after pre-exposure during the first test session was 0.97 in an unselected sample of 51 subjects, indicating satisfactory split-half reliability.

The pupils of all subjects above the age of 40 were dilated with 5 per cent euphthalmine administered two or three times within the hour prior to testing in order to eliminate the miosis in older subjects. Pupil size was esti-

mated at the end of the test by holding a millimeter scale beneath the eye of those subjects treated with the mydriatic. Light thresholds were converted to a 5 mm. pupil. The younger subjects were not dilated because of previous indications that the young pupil dilates sufficiently above the level where pupil size is a significant factor (9).

Three principal groups of male subjects were used: (a) 49 from the Baltimore City Hospitals' home for the indigent aged, (b) 43 members of the William Hodson Recreation Center for the elderly in New York, and (c) 25 Navy enlisted men. In addition, 13 laboratory technicians of various ages were included.

The aged Baltimore subjects were all ambulatory and did not require hospitalization. Regulations for admission required that individuals be able to care for themselves but lack financial means to maintain themselves in the community. The New York group was still resident in the community and attended a voluntary recreation center for the elderly. The principal financial support of this group was state and federal old age assistance. The previous economic status of 25 Navy enlisted men is indicated by the fact that only one had some college training. The groups studied were thus of a lower middle or marginal economic status.

Results

The results of the present study demonstrate a significant decline in the sensitivity of the dark adapted eye in later life (table 1). This change in the minimum light threshold was most marked after the age of 70 years. The difference between age 18 to 29 and age 50 to 59 was 0.22 log. $\mu\mu$l; the difference in the threshold between age 18 to 29 and age 70 to 90 was 1.23 log. $\mu\mu$l and was statistically significant beyond the 1 per cent level.

The range of individual differences increases with age as indicated by the increased standard deviations (table 1). The ratio of the variances (F), for example, between the 18 to 29 and the 60 to 69 year old groups indicates that the increment in variability is significant ($P < 1\%$).

Table 1. Age and Minimum Light Threshold. Mean Threshold to Violet Light (460 $\mu\mu$) After 28 to 30 Minutes of Dark Adaptation

Age	N	Mean 28–30 Min.	σ	σ Mean
12–19*	90	2.76	0.20	0.02
18–29	31	2.62	0.27	0.04
30–49	17	2.67	0.44	0.11
50–59	12	2.84	0.39	0.12
60–69	29	3.16	0.47	0.09
70–79	34	3.85	1.11	0.19
80–83	7	3.89	0.84	0.34

* Data from Hunt, 1941 (5).

N = Number of subjects.

σ = Standard deviation.

σ Mean = Standard error of the mean.

The age group showing maximum sensitivity of the dark adapted eye was 18 to 29 years, although the mean of this group was not significantly different from the next age group (table 1). It is apparent from these data that little change is observed from the second to the fourth decades. This observation is in agreement with that of others (9, 13). Data on the subjects above 60 years suggests progressive deterioration of function, a fact not shown by previous studies either because of an insufficient number of subjects or lack of subjects beyond 60 years.

The pupil size correction factor applied after dilation had little influence on the resulting means. In the 60 to 69 year old group, the mean uncorrected threshold was 3.03 log. $\mu\mu$l as contrasted to the mean corrected value of 3.16. Similarly in the 70 to 79 year group, the uncorrected mean was 3.64 log. $\mu\mu$l as contrasted to a corrected mean of 3.85. Neither of these differences is statistically significant. The correction for pupil size after dilation was thus not critical in the present study. As Sloan (11) has pointed out, the magnitude of correction is not large except in pupil sizes of less than 5 mm.

Comparison of the institutionalized with the noninstitutionalized populations was made to test the possibility of a gross sampling bias that might arise from studying solely an institutionalized aged population. Mean values for the two groups were not significantly different (table 2). It is apparent that the insti-

TABLE 2. COMPARISON OF INSTITUTIONALIZED AND COMMUNITY RESIDING SUBJECTS. MEAN THRESHOLD TO VIOLET LIGHT AFTER 28 TO 30 MINUTES OF DARK ADAPTATION. THRESHOLDS CORRECTED FOR PUPIL SIZE.

Age		New York Community Residing	Baltimore Institutionalized	
60–70	Mean	3.07	3.23	Dif. = 0.16
	σ	0.36	0.53	t = 0.93
	σ Mean	0.10	0.14	P > 30%
	N	13	16	
70–80	Mean	3.90	3.76	Dif. = 0.14
	σ	1.15	1.02	t = 0.35
	σ Mean	0.24	0.34	P > 70%
	N	24	10	

Mean = log. $\mu\mu$l
N = Number of subjects
σ = Standard deviation
σ Mean = Standard error of the mean
t = Fisher's t
P = Probability

tutionalized population was not atypical in its light thresholds with respect to persons of comparable age still living in the community.

The question may be raised whether the age difference noted in this study using violet light would have also appeared with white or incandescent light. Relevant to this question was data gathered on a group of 8 subjects below the age of 30 years and 13 subjects above 50 years tested with both white and violet light. The difference between the violet and white light thresholds was not significantly greater for the young than for the aged subjects, i.e., this difference was 1.29 log. $\mu\mu$l for the aged and 1.44 log. $\mu\mu$l for the young subjects. Even if this difference were assumed to be real, only 0.15 log. $\mu\mu$l of the age increment in light threshold could be attributed to the use of violet light. It is apparent that the use of either violet or white light is not critical for the demonstration of the effect of aging on the light threshold.

DISCUSSION

The present study reports data which indicate a significant age rise in minimum light threshold of the dark adapted eye. Since pupil size was controlled in the present study, the previous explanation by Robertson and Yudkin of age change in minimum light threshold based on pupil size cannot be accepted (9).

The elevation of the minimum light threshold in later life reported in the present investigation cannot be explained at present. It is reasonable to assume that the presence of structural changes in the ocular media and retina of the older eye may be a contributing factor. Observations were made in the present series of subjects on ocular structural changes. The correlation between such changes and dark adaptation will be the substance of a subsequent report.

Generalization with respect to the deterioration of dark adaptation reported in this study as applied to the population at large is impossible at present because the study did not include subjects from high socio-economic levels. Since various pathologic processes and dietary deficiencies occur more frequently in the lower economic groups, aging of particular functions may show marked differences, depending upon the economic levels studied (5, 15). There is the possibility that the chronic operation of all variables associated with economic status accentuates group differences in later life. Thus, aging phenomena may be more closely tied to economic levels than phenomena studied only in children or young adults.

SUMMARY AND CONCLUSIONS

1. Minimum light thresholds were determined on subjects of different ages. Measurements were made with a Hecht Shlaer adaptometer following three minutes of light adaptation. The stimulus was a circular 3° patch of violet light (460 $\mu\mu$), presented 7½° on the temporal retina in 0.2 sec. flashes. Mean thresholds after 28 to 30 minutes of dark adaptation were used for comparative purposes. Pupils of the subjects beyond 40 years were dilated with euphthalmine.

2. A total of 130 male subjects was tested, age range 18 to 83. Included in this population were 49 subjects institutionalized in a home for the aged, 43 subjects living within the community and attending a recreation center for the elderly, 25 Navy enlisted men, and 13 laboratory technicians.

3. A significant age decline in sensitivity of the dark adapted eye was found. This decline was most marked in subjects beyond the age of 60, a range not covered adequately in previous studies. The difference in thresholds between the 18 to 29 and 70 to 79 year old groups was 1.23 log. $\mu\mu$l. In addition to loss of sensitivity, an increased range of individual differences was found in the older groups. The loss of visual sensitivity was not the result of reduced pupil size in the elderly.

4. Comparison of institutionalized and community-residing subjects indicated a lack of significant difference.

The experiments were conducted in the laboratories of the Section on Cardiovascular Diseases and Gerontology of the National Institutes of Health, Baltimore City Hospitals, Baltimore, Maryland, in collaboration with the Wilmer Ophthalmological Institute of Johns Hopkins Hospital and University, Baltimore, Maryland.

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The senior author's address is:

Dr. James E. Birren

Section on Cardiovascular Diseases and Gerontology

Baltimore City Hospitals

Baltimore, Maryland

The Pulse Rate in Old Age

TREVOR H. HOWELL

BECAUSE OF THE SCARCITY OF INFORMATION ON THE PULSE RATE WITH ADVANCING YEARS, DR. HOWELL HAS CONDUCTED AN INVESTIGATION ON 335 MEN RANGING IN AGE FROM 60 TO 93 YEARS. THE VARIATION IN FREQUENCY OF THE PULSE RATE, THE RATE IN RELATION TO AGE, AND THE CLINICAL IMPLICATIONS ARE SHOWN.

DURING the eighteenth century physicians were obsessed by the diagnostic value of the radial pulse; during the nineteenth they were interested in it; during the twentieth they ignore it. Galen (6) wrote sixteen essays on the pulse; Floyer (6) wrote a book on the subject. Even in 1884 Fothergill (5) could devote a chapter of twenty-eight pages to the topic but a recent handbook of clinical methods (11) dismisses the matter in nine short paragraphs.

This declining interest is reflected most particularly in the literature on old age. Cowdry (4) and Stieglitz (12) make no reference at all to the pulse rate in advancing years. Thewlis (13) merely states that bradycardia is often found.

In the preceding century, however, more data appeared. Balfour (1) discusses the incidence of a slow pulse rate in apparently healthy persons. Humphrey (8) gives us some statistics on this topic. Writing on the pulse rate of some 57 men between 90 and 100 years, he states, "average, little over 75 per minute." Concerning 280 men between 80 and 90 years, he tells us "average about 74 per minute . . . a large number had pulse rate below 70." Loomis (3), who studied under Charcot, thinks that the normal rate is between 60 and 70 beats per minute for old men, or between 68 and 78 for old women. Pinnock (9), in a series of apparently normal old people, finds the average to be 71.8 beats per minute for men and 70.5 for women. Hourmann and Dechambre (9) give 82.3 as the mean in 255 old women. Richerand and others, as quoted by Maclachlan (9), testify to the frequency of a very slow pulse in the elderly under their care.

In view of these variations and the lack of recent information about changes in the pulse rate with advancing years, an investigation was undertaken. The subjects were healthy, active Chelsea pensioners at the Royal Hospital, Chelsea, in London. All men with known cardiac disease or arrhythmias were excluded from the series. They were examined after a period of rest as part of a routine medical inspection. Thus emotional tachycardia was unlikely to be important. The ages of those examined ranged from 60 to 93 years, with the mean 74.55 years for the total of 335 old men. The age distribution is shown in table 1.

TABLE 1. AGE DISTRIBUTION OF SUBJECTS

Age Group	Number
60–64	11
65–69	36
70–74	145
75–79	81
80–84	40
85–89	19
90–94	3
Total	335

Any unusually high or low figure was always checked a second time before being recorded. It was found, however, on going through the figures that a certain number of pulse rates had been timed for a quarter of a minute while the rest had been counted for half a minute. For this reason the number of men with a rate which is a multiple of four has been added to the number with a rate

Dr. Howell is physician to the Geriatric Unit which he created at St. John's Hospital, London, to facilitate his research into various problems of old age with a grant from the Nuffield Foundation. After qualifying as M.R.C.S. and L.R.C.P. at St. Bartholomew's Hospital, London, in 1934, he spent a year as house physician at St. Olave's Hospital (London County Council) before going to study and tutor at the British Postgraduate Medical School which was just starting. At the end of 1937 he went to Edinburgh to work in the electrocardiograph department and took his Edinburgh M.R.C.P. He spent two years in general practice until called up for military service in 1939. From then until 1944 he was Deputy Surgeon at the Royal Hospital, Chelsea, where he began his research on old age. After a year in India and Burma as Medical Specialist, he was demobilized and returned to general practice until he started his work with the Geriatric Unit. Dr. Howell has been appointed Lecturer in Problems of Old Age at St. Bartholomew's Hospital, London, and is honorary secretary to the Medical Society for the Care of the Elderly which was formed in England in 1947.

two greater (figure 1). The result is a much smoother gradation.

The distribution of pulse rates is shown in figure 1. It will be seen that there is a range varying from 44 to 108 per minute. Although this variation is considerable, it is not much greater than in a series reported by Burn (*2*), who examined a small group of medical students and found variation from 52 to 103 beats per minute. In the pensioners of the present series the mean rate was 71.76, the mode 72, and the standard deviation 10.9 beats per minute.

When the changes of pulse rate with advancing years were examined it was found that the mean pulse frequency diminished steadily between 60 and 84 years (figure *2*). Over this age, however, the rate rose sharply. The relative numbers in the different age groups vary so much that the latter part of the curve will need further confirmatory investigation. The exact figures are given in table *2*.

In view of these findings, correlation coefficients were calculated for first, the whole series; second, the range 60 to 84 years; third, 80 to 93 years. The results were (1) —0.081, (*2*) —0.137, (3) +0.200. Of these only the second is significant and unlikely to be merely the effect of a chance distribution in such subjects. The interpretation of these results is that the apparent fall of pulse rate with age over the range 60 to 84 years is a real one, although the connection is not very

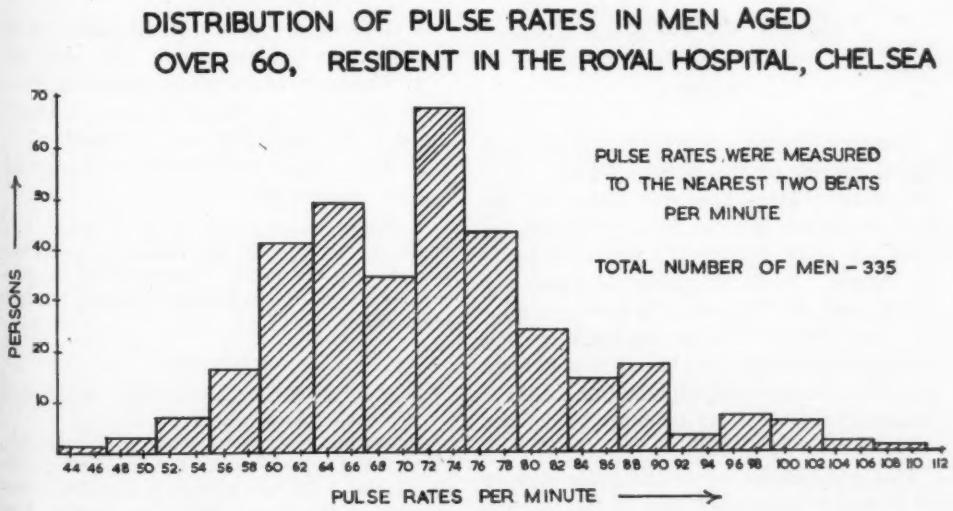
DISTRIBUTION OF PULSE RATES IN MEN AGED OVER 60, RESIDENT IN THE ROYAL HOSPITAL, CHELSEA
PULSE RATES WERE MEASURED TO THE NEAREST TWO BEATS PER MINUTE
TOTAL NUMBER OF MEN – 335
PERSONS
70
60
50
40
30
20
10
44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112
PULSE RATES PER MINUTE

FIGURE 1

rigid. The apparent rise in the range 85 to 94 may not be a real one since it might easily have occurred by chance. It is sufficient to make it impossible to claim statistically that the fall of pulse rate with age applies to the whole range between 60 and 94 years.

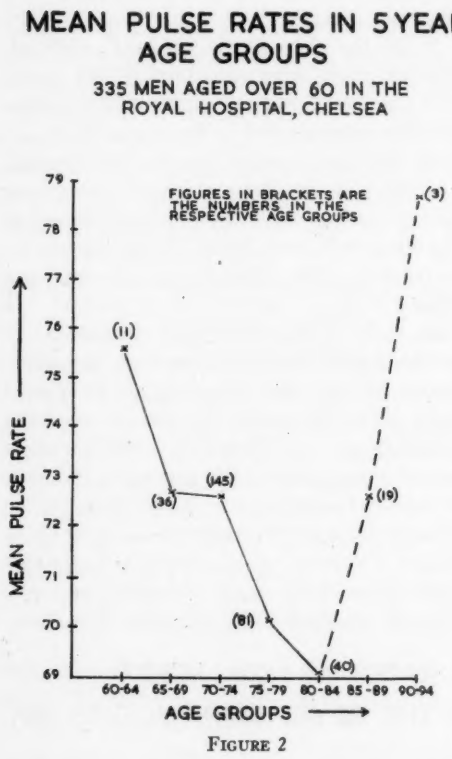

FIGURE 2

The only reference which I have been able to find bearing on this point is Minot (10), who quotes Porter. The latter states that the mean frequency is from 60 to 65 years, 73 beats per minute; 65 to 75 years, 75 beats per minute; 75 to 80 years, 72 beats per minute, and over 80 years, 79 beats per minute. Since the number of observations upon which these findings are based is unknown, they must be accepted with caution. Nevertheless, it is interesting to note the definite rise in the last age group.

This great variation of the pulse rate in old people is the explanation of the relative uselessness of pulse charts in trying to assess the onset of an acute infection. It had already been noted (7) that the pulse rate varied from 76 to 108 in a small series of Chelsea pensioners admitted to the infirmary of the Royal Hospital with acute bronchitis. This rate on admission was found to have no bearing upon the severity of their disease nor the ultimate prognosis. In the same way that a temperature of 98.4 F. may indicate two or even three degrees of fever in an aged person, so may a pulse rate of 72 sometimes represent an appreciable tachycardia. It will thus be seen that the present investigation has more than an academic value.

TABLE 2. PULSE RATE AND AGE GROUPS

Age Group	Mean Pulse Rate	Cases
60–64	75.6	11
65–69	72.7	36
70–74	72.6	145
75–79	70.1	81
80–84	69.1	40
85–89	72.6	19
90–94	78.7	3
Overall mean	71.76	335

SUMMARY

1. The resting pulse rate of 335 healthy Chelsea pensioners has been recorded.

2. The range of frequency varied from 44 to 108 beats per minute.

3. The mean pulse rate fell between 60 and 84 years but rose again after that age.

4. The mean of the whole series was 71.76 beats per minute; the mode was 72 beats; the standard deviation was 10.9 beats.

5. The clinical implications of these findings are pointed out.

Acknowledgement is made to J. A. Heady, Esq., Statistician, St. Bartholomew's Hospital, for his help with the statistics and to the members of the nursing staff of the Royal Hospital, Chelsea, for their assistance.

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The author's address is:

Dr. Trevor H. Howell

Geriatric Unit, St. John's Hospital

London, S.W. 11, England

A Study of the Influence of Institutionalization on the Social Adjustment of Old People

JU-SHU PAN

USING NINE CRITERIA OF ADJUSTMENT ON 116 ELDERLY WOMEN LIVING IN LARGE INSTITUTIONS, MR. JU-SHU PAN COMPARES THE GROUP WITH A LARGER NONINSTITUTIONALIZED GROUP INVESTIGATED BY DR. CAVAN OF THE SOCIAL SCIENCE RESEARCH COUNCIL AND ON THE BASIS OF STATISTICAL EVALUATION CONCLUDES THAT THE ADJUSTMENT OF THE INSTITUTIONALIZED PERSON ON THE WHOLE IS LESS SATISFACTORY.

THE PURPOSE of this study is to indicate some of the effects of institutionalization on adjustment in later life. A recent study by Dr. Ruth Cavan (1) investigated the attitudes and social conditions of 2,988 noninstitutionalized old individuals. The present study applies the same schedules and techniques of analysis to a smaller group of persons living in homes for the aged and attempts to indicate the differences in adjustment between the two groups. Criteria of adjustment employed in the studies are the following: (1) success in maintaining social status and a constant social setting, (2) absence of personal difficulties, (3) possession of an interest in living, (4) companionship, (5) good health, (6) good adjustment and flexibility in the past, (7) feeling of economic security, (8) religious faith and philosophy of life, and (9) feeling of indispensability and usefulness.

The subjects in the present study were 116 women over 60 years of age living in 12 institutions for the aged in the Chicago metropolitan area. They were of various educational levels and adhered to the Protestant and Jewish faiths, except for a few who had no religious affiliation. They differed from the subjects in Dr. Cavan's study in the following ways: they were older (mean age in the present study, 76.7 years, in Cavan's, 71.4 years), were of lower socio-economic status, had less average education, and came entirely from a large metropolitan area instead of from cities of various sizes and rural districts. These facts rather than institutionalization may account for some of the differences between the two groups. The critical ratio was employed as a measure of significance of difference between the results obtained by the two studies. Throughout the entire study the formula between two means was: $\text{C.R.} = \frac{x_1 - x_2}{E_d}$ where $E_d = \sqrt{\frac{p_1 q_1}{N_1} + \frac{p_2 q_2}{N_2}}$ and X_1 and X_2 are the respective means of each series.

COMPARISON OF SCHOOL LEVEL COMPLETIONS OF THE INSTITUTIONALIZED AND NONINSTITUTIONALIZED INDIVIDUALS

School level completed	Percentage Present Study	Percentage Cavan Study	C.R.
No schooling	1.0	.7	...
Grade school	42.0	18.9	4.4
High school	31.6	22.9	1.6
College	16.3	39.2	3.3
Post-graduate and professional	9.1	18.3	3.1

To aid in the analysis of the findings, related results obtained from the investigation of the subjects' activities and attitudes were combined into scores for physical mobility, social mobility, interest, evaluation of past life, companionship, participation, personal difficulties in adolescence, in middle age, and in old age.

The more important findings of this study

Mr. Ju-Shu Pan received his A.B. degree from the National Tsing Hua University, Peiping, China, in 1933 and obtained an M.A. degree in sociology from the University of Chicago in 1947.

The present paper represents a summary of his master's thesis, "A Study of the Personal and Social Adjustment of the Old People in the Homes for Aged" written under the direction of E. W. Burgess, Herbert Goldhamer, and Ruth Shonle Cavan. The unabridged thesis is available at the library of the University of Chicago.

will be presented under the nine criteria of adjustment listed. Wherever possible comparison with the 1,804 women in the Cavan study will be made to indicate possible differences caused by institutionalization.

1. Success in maintaining social status and a constant social setting. Important changes are summarized as follows:

Class of neighborhood lived in:	Percentage
Same as 15 years ago	63.8
Lower than 15 years ago	24.8
Higher than 15 years ago	11.4
Economic status:	
Same as at ages 40 to 60	73.2
Worse than at ages 40 to 60	23.3
Better than at ages 40 to 60	3.5
Things given up because of economic condition:	
Nothing	43.0
1 or 2	32.0
3 or 4	20.0
5 or 6	5.0

Things most frequently given up included home, church, clubs, automobile, vacations; in other instances the change in social status was indicated by the purchase of a less expensive home or car and failure to keep home furnishings in repair. Fifty per cent of the Cavan subjects reported giving up nothing (C.R. = 1.0). Church or clubs were given up for economic reasons by 14.1 per cent of the subjects in the present study and only 5.8 per cent in the Cavan study (C.R. = 3.3). Most frequent downward changes of neighborhood were from upper middle to middle class and from upper class to upper middle.

2. Personal difficulties. The two studies revealed no significant difference in adolescent difficulties, but 11.4 per cent of the Cavan subjects reported a high number of adult difficulties (3 to 6 scores out of a maximum of 7) as compared with 6.9 per cent of the institutionalized subjects (C.R. = 2.2). Significant differences in present difficulties included: living arrangements made from necessity, 15.4 per cent of the institutionalized group and 5.0 per cent of the Cavan subjects (C.R. = 2.7); nothing to do, 9.0 per cent of the institutionalized subjects and 0.1 per cent of Cavan subjects (C.R. = 8.9).

3. Possession of an interest in living. Differences in vital interest are indicated in the following items:

Item	Percentage Present Study	Percentage Cavan Study	C.R.
Absence of nervous breakdown	65.9	79.4	3.1
Evaluation of past life:			
Low score (0–4)	24.2	9.0	3.0
Middle score (5–6)	44.2	42.0	0.8
High score (7–8)	31.6	49.0	3.5
Interests in life:			
Low score (0)	25.5	44.3	4.0
Middle score (1–2)	57.1	45.9	2.1
High score (3–9)	17.4	9.8	1.9

None of the subjects in the present study were employed, although a smaller percentage (2.6) reported stopping work because of loss of interest than in the Cavan study (24.9 per cent; C.R. = 2.5).

4. Companionship. Scores for companionship and participation in activities were computed by combining relevant answers to a number of questions, with the following distributions:

Item	Percentage Present Study	Percentage Cavan Study	C.R.
Companionship:			
Low score (0–1)	68.0	23.2	9.5
Middle score (2–3)	26.2	54.0	6.0
High score (4–5)	5.8	22.8	6.8
Participation:			
Low score (0–3)	41.0	11.8	5.8
Middle score (4–6)	43.0	35.0	1.6
High score (7–9)	16.0	53.2	9.0

There is little social interaction among residents of the institutions. This combined with infrequency of outside contacts makes the resident's life a rather lonely one.

5. Good health. The effect of age on health was evident in both studies by the increase of blindness and deafness. The present study shows a higher percentage of crippled persons than the Cavan study because the present study includes some cases from the Home for Incurables in Chicago. The analysis of neurotic symptoms included: sleeplessness, bad dreams, easy fatigability, poor appetite, crying spells, nervousness, forgetfulness, and sensibility to noise. Among these symptoms nervousness and bad dreams appeared more frequently in the sample for the present study, while the item easy fatigability appeared more frequently in the Cavan sample. For the two groups the correlation coefficient between the total attitude score (as an estimate of general adjustment, including responses to all attitude questions) and the health rating is higher ($r = +0.43$) for the Cavan group; that is, there is a clearer relation between adjustment and actual health for the Cavan group than for the institutionalized group ($r = +0.31$). The correlation coefficient of the total attitude scores and the number of neurotic symptoms in both studies among women is highly negative (present study —0.58, Cavan study —0.43).

6. Good adjustment and flexibility. This category, investigated in terms of attitudes toward family and friends, showed the following selected scores:

Item	Percentage Present Study	Percentage Cavan Study	C.R.
Attitude toward family:			
Low score (unfavorable)	5.8	0.9	2.1
Middle score	68.1	58.1	2.0
High score (favorable)	26.1	41.0	4.4
Possession of children and relatives:			
Both children and relatives	21.2	40.2	4.5
Children or relatives only	46.0	47.4	..
Neither children nor relatives	32.8	12.4	4.5
Closeness to children:			
Low score	31.1	6.3	4.5
Middle score	47.8	33.4	2.7
High score	21.1	60.3	8.6
Frequency of contact with friends:			
A few times a year	52.0	23.1	4.2
Once a week to twice a month	34.0	50.0	3.8
Every day	14.0	26.9	3.7
Frequency of contact with friends now as compared with ten years ago:			
Less often	37.8	28.3	2.0
About the same	24.4	11.3	3.0
More often	37.8	60.4	4.0
Number of friends among children and young people, including relatives:			
None	4.8	2.9	..
Few	43.8	31.5	2.7
Many	51.4	65.6	2.8

The noninstitutionalized group showed higher scores in respect to good adjustment toward family and friends.

7. Feeling of economic security. Attitude toward employment was rated by a series of statements ranging from "I can no longer do any kind of useful work," to "I do better work now than ever before" (high score). Distribution of scores is as follows:

Score	Percentage Present Study	Percentage Cavan Study	C.R.
Low (1–3)	22.5	10.5	2.5
Middle (4–5)	29.5	51.2	4.5
High (6–7)	48.0	38.3	2.2

The present data yields low and middle attitude scores toward employment. The Cavan data showed a significantly higher proportion of persons having a college education (16.3 per cent in present female subjects and 39.2 per cent in the Cavan study) (C.R. = 3.3), and a significantly greater number with the profession of college teacher or administrator and church worker as well as significantly more retired persons. The present data, on the other hand, indicate a higher proportion of persons with clerical, semi-skilled, and unskilled occupations, and of persons who cannot work because of age and health (45.5 per cent in the present fe-

male subjects and 20.5 per cent in the Cavan female subjects, C.R. = 4.5). Those of the former study, then, had better jobs and enjoyed better economic conditions than those of the latter.

The Cavan data showed higher proportions of persons who belonged to the well-to-do class, possessed insurance, savings and pensions, in addition to the differences already indicated under social status.

8. Religious faith and philosophy of life. The present data shows a higher proportion of Jewish affiliation (12.9 per cent of present cases against 1.9 per cent in the Cavan individuals), while the Cavan data showed a higher proportion of the Roman Catholic faith (5.5 per cent against none in the present investigation). The present data shows a higher proportion of persons who listen to church sermons on the radio (C.R. = 3.6) or read the Bible every day (C.R. = 5.0), both of which facts imply that the present subjects show more religious devotion than the Cavan cases. The philosophy of life revealed most frequently by the women in the present study is that of resignation.

9. Feeling of indispensability and usefulness. The score on attitude toward membership in organizations and the amount of free time are partial indices of feeling of usefulness. Significant data in point follow:

Item	Percentage Present Study	Percentage Cavan Study	C.R.
Attitude toward social organizations:			
Low score (1–3)	25.0	17.0	1.6
Middle score (4–5)	55.6	35.5	2.2
High score (6–7)	19.4	47.5	4.7
Amount of time free:			
None	3.7	6.0	..
Few hours	11.0	21.0	3.0
Half day	3.7	14.0	4.7
All day	81.6	59.0	5.5

The Cavan study also showed a higher proportion of persons who are active in a number of organizations and who held several offices, both of which findings indicate that the Cavan subjects had more participation in organizations than the present cases. Also, the Cavan data showed a higher proportion of outside home activities (C.R. = 2.3), while the present data shows a higher proportion of inside home activities (C.R. = 4.0), probably because, as previously mentioned, the former group was 5.3 years younger and of higher economic status. The Cavan group also indulged in more plans and hobbies (C.R. = 5.0), while the latter group, because of greater age and lower economic status, had little to do other than spend the entire day listening to the radio.

Attitude scores on feelings of usefulness and happiness bear out the superior adjustment of the noninstitutionalized group.

Item	Percentage Present Study	Percentage Cavan Study	C.R.
Attitude toward usefulness:			
Low score (1–3)	3.9	3.4	..
Middle score (4–5)	34.9	19.9	3.0
High score (6–7)	61.2	76.7	3.5
Attitude toward happiness:			
Low score (1–3)	16.5	13.5	0.8
Middle score (4–5)	65.1	57.4	1.8
High score (6–7)	18.4	29.1	2.8

SUMMARY

In summary, the adjustment of old people in institutions is not as good as that of old people outside institutions with regard to the following factors: mobility, adolescent, adult, and present difficulties, satisfaction in life, interest in life, attitude toward past life, companionship, participation in activities, and attitude toward health, family, friends, employment, organizations, security, leisure and recreation, happiness, and usefulness.

On the other hand, the adjustment of old people in an institution has been found to be better with regard to the following factors: religious affiliation, resignation to life philosophy, participation in inside home activities, interest in listening to the radio (either music or church sermons) and reading the Bible every day.

There is no group of persons whose welfare is more neglected than that of old people. The neglect is world-wide. Even those countries which are reputedly the most advanced with respect to social service gener-

ally think that old age pensions are a sufficient solution to the problem. Recent studies indicate that other than economic factors are also important. It may very well be that the United States will be the leader in the new sciences of geriatrics and gerontology.

Finally, though no unqualified conclusion can be reached because such factors as age, education, socio-economic status, and home community have not been held constant, the adjustment of old people in institutions in the present sample has been found inferior to that of old persons not in institutions in the Cavan sample.

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The author's address is:

Mr. Ju-Shu Pan

1414 East 57th Street

Chicago 37, Illinois

The Geriatric Group in a General Hospital: Organization and Objectives

FREDERIC D. ZEMAN

DR. ZEMAN SUPPORTS THE VIEW THAT CARE OF THE AGED IN A GENERAL HOSPITAL CAN BEST BE ACCOMPLISHED BY THE ESTABLISHMENT OF A GERIATRIC GROUP WITHIN EACH LARGE HOSPITAL. THE ORGANIZATION AND OBJECTIVES OF SUCH A GROUP ARE DISCUSSED.

The rapidly increasing number of older individuals in our population together with the sharp decrease in the incidence and severity of infectious diseases has profoundly affected the problems confronting the medical profession. Whether engaged in public health work or in private practice, in industrial medicine or in university teaching, the physician of today is finding that more and more of his patients are in the older age groups and present a variety of maladies whose ordinary manifestations have been altered by the processes of senescence.

The effect of population changes on medical practice was predicted by Dublin in 1941 (1). Over four years ago Kresky and Luykx reported on the experience of the Third Medical Division, Bellevue Hospital, New York, under the suggestive title, "The Patients are Older and Stay Longer" (2, 3). Their study, based on the experience of a large general hospital in New York City, is typical of the entire country and makes necessary the evaluation of the responsibility of this type of institution to the older members of our population.

Even in the Coordinated Hospital Service Plan of the United States Public Health Service where adequate institutional provision is made for chronic illness, the general, or base, hospital will have to provide the aged with diagnostic service requiring complete procedures as well as with therapy involving the use of new or heavy equipment. Its psychiatric division will be called upon to furnish diagnostic and therapeutic service for elderly sufferers from mental disorders and to differentiate those requiring state hospital care from those for whom short term treatment may suffice. Research programs aiming to clarify the physical and mental disorders of the old must also be included in the program of the general hospitals.

THE NEED FOR A SPECIAL GERIATRIC GROUP

In view of the manner in which most general hospitals are at present organized and of the present state of medical education, it may be seriously questioned whether these institutions are completely aware of their new responsibilities and further whether their medical, nursing, and social service staffs are adequately trained to meet the special requirements of the aged. For this reason I believe that the increasing magnitude of these new problems demands the development of aggressive policies designed to bring to each individual old patient the best care that the hospital's facilities and staff are capable of giving.

To accomplish this I am convinced that each hospital should organize a special staff group devoted to the study of geriatrics in the broader sense and particularly to the special geriatric problems of the individual institution. Such a staff unit would serve to focus interest on the aged throughout the organization, would by its own concern stimulate better and more understanding care, would integrate the hospital's activities on behalf of the aged with those of other community agencies, would train physicians,

Dr. Frederic C. Zeman received his M.D. degree from Columbia University, College of Physicians and Surgeons in 1917. He is practicing internal medicine in New York City and serving as a member of the attending staff of the Mt. Sinai Hospital and as Chief of Service of the Home for Aged and Infirm Hebrews.

nurses, and social workers in this special field, and finally would engage in original studies of the aged from the medical, nursing, and social service points of view. The group would function under the authority of the lay board and the medical board and would have free run of the institution for the observation of patients. Its services would be available for consultation only, since the actual responsibility for the patients would remain in the hands of the members of each hospital division.

The suggestions incorporated in this communication represent an ideal, because nowhere is such a plan in operation for the aged in a general hospital. The success of special study groups at the Mount Sinai Hospital has profoundly influenced my thinking. The Chest Group, originally organized by Dr. Harold Neuhof and Dr. Harry Wessler, and the Liver Group, headed by Dr. Ralph Colp and Dr. Reuben Ottenberg, have made substantial contributions to the work of the hospital in these fields and added notably to the sum of medical knowledge.

Personnel of the Group

The Geriatric Group should include physicians, nurses, and social workers chosen from the general hospital staff, if possible, for their expressed interest, knowledge, and special training in the problems to be studied. At the beginning one member of each professional group would be adequate for setting up the organization and preparing the initial plans. The head of the group should be an internist, who should shortly choose as associates a surgeon, a psychiatrist, and a pathologist. Members of other specialty groups may be added as their assistance is needed. The professional nurse should be a mature individual with a background of academic study, teaching, supervisory, and actual bedside nursing experience. The social worker should likewise be a well trained case worker with particular knowledge of psychiatry and of the utilization of community resources. It is assumed that senior group members would possess qualities of leadership and be capable of original work.

Frequent group conferences would lead to formation of sound policy, to pooling of experiences, to correction of errors in procedure, and to the development of stimulating cooperative efforts. Each professional member of the Geriatric Group would assume the responsibility for the interpretation of the joint effort to the special staff units which they represent. Welcome additions to the Geriatric Group might be recruited from the hospital administration and from the lay board of directors, since the understanding cooperation of these two bodies is essential to success.

Activities of the Group

The first item on the agenda of the Geriatric Group would also serve as the justification of its existence, namely, a statistical survey by age and sex of the hospital in-patients and out-patients over a period of five to ten years. This information would throw light on the local problem by establishing the actual state of affairs in a decisive manner far superior to mere opinions. The facts thus ascertained by reason of their range over the years would serve as a basis on which to estimate future needs of the hospital. Above all, this information would show clearly the size of the immediate task confronting the group. It may be of assistance also in determining whether first efforts should be directed toward the wards or the out-patient department.

The medical member of the group or a physician assigned by him would be held responsible for covering the medical services. A surgeon would carry out a similar function in the surgical wards, and the psychiatrist would do likewise. Integration of the study

of the aged would be achieved by the weekly rounds of the group through the whole hospital, if it is not too large, or rounds on medicine one week and on surgery the next week. Naturally any relevant material in the domain of the pathologist would be studied as it becomes available. Group conferences would be held at least once a month.

In time the members of the group may be expected to achieve experience with both the medical and surgical problems of aged patients. The group's opinion would then be sought in consultation by the men actually in charge of and responsible for the care of the patients. Only at such time would the opinion of the group be entered on the hospital record and its advice as to procedure and treatment be officially recorded.

It would be necessary for the group to have its own secretary and to keep its own records. These would in no way duplicate those of the hospital but would serve to keep track of the clinical material that has been studied and to correlate it with current cases. At the end of the year the group should be able to report the number of patients over 60 years old treated in the hospital by age, sex, diagnosis, and disposition, with notes on particular patients that have been especially instructive.

In the out-patient department the group would probably find it worth while to establish a Geriatric Clinic. This will serve as a place where aged clients would be received with interest, sympathy, and understanding. Emphasis would be not only on the diagnosis and treatment of specific complaints but also on the prevention of disease. This would be achieved by encouraging periodic health examinations and by developing a program of mental hygiene. Study of the home surroundings and family situations of the clients by the representative of the social service department would help in the understanding of psychosomatic disorders and personality problems. Here the psychiatrist would naturally assume leadership. If possible, programs of occupational therapy and recreation may be developed in cooperation with other departments of the hospital or with other agencies. In this special clinic the record keeping would be carried out in accordance with the general usage of the whole department, but special records would be necessary in order to correlate these activities with those of the hospital wards.

Once well established and functioning smoothly as a study group within the hospital and as a special clinic in the out-patient department, abundant opportunities would arise for teaching. Among those who might be helped by friendly instruction would be other staff members who might at first tend to be somewhat supercilious about the entire effort, house staff members who considered anyone over forty years old and uninteresting, and members of the nursing staff who tended to address any patient with grey hair as "Pop" or "Mom." Social workers, administrative heads and board members would need enlightenment as well. This might be best accomplished by setting an example of proper behavior toward the older patients. Staff men and interns are apt to be rather impressed by the fascinating diagnoses the group would be able to make on what seems to be an "old chronic," who should have been transferred long since. Of course, once the group members achieved publication of some of their strange ideas, a new note of respect would be observed on the part of the professional staff.

Where needed or asked for, special lectures or series of talks could be given to the house staff, to the school of nursing, and to the social service department. The group should of course take special steps to see that the hospital library acquires the standard books of reference on old age and the medical journals devoted to the subject. It would surely find it rewarding to send one or more of its members to visit other centers where similar work is being done.

From time to time under direction of the head, interesting cases, groups of cases, or general topics may be presented at conferences, hospital meetings, local medical society meetings, and eventually submitted to medical journals for publication. Such opportunities serve to stimulate men to careful work

and make them feel that they are contributing to the advancement of medicine as well as adding to their own professional prestige. Far more important to the real work of the group would be such annual reviews of its endeavors as might be prepared for its own instruction. As a result of their statistical and clinical studies the group might wish from time to time to make recommendations through channels to the Medical Board or the Board of Managers for improvement of the hospital's services, or for cooperation with other agencies.

Summary

The general hospital is caring for an increasing number of older men and women who present not only complex medical problems but also a variety of social and economic problems. To serve these aged individuals more effectively, the suggestion is made that a special Geriatric Group be organized in each large hospital to study their medical, surgical, and psychiatric needs. Such a group must include social workers and graduate nurses. It would function in the hospital wards and in the out-patient department and would have important responsibilities for teaching and for the advancement of medical knowledge. It would integrate the work of the general hospital with that of other health and welfare agencies. Through this group's activities the older patients would receive better care and would find their hospital sojourn a far happier experience.

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The author's address is:

Dr. Frederic D. Zeman

111 East 88th Street

New York, New York

CICERO'S IDEAL OLD MAN

ALBERT R. CHANDLER

NEARLY TWO THOUSAND YEARS AGO CICERO WROTE A DIALOGUE ATTEMPTING TO DEPICT, IN THE CHARACTER OF CATO, OLD AGE AT ITS BEST. DR. CHANDLER DISCUSSES THE COMBINATION OF TRAITS WHICH COMPOSED THIS IDEAL CHARACTER AND COMPARES CICERO'S VIEWS ON OLD AGE WITH THOSE OF ARISTOTLE AND THOSE OF A PRESENT-DAY PSYCHOLOGIST.

WHAT is old age like at its best? That seems to be the question which Cicero sought to answer in his dialogue *De Senectute* (*On Old Age*). Although this is the most famous literary work on old age, I suspect that it is generally neglected by psychologists. We foolishly think that anything so ancient must be out of date, but if we examine it we shall find that it foreshadows many modern ideas.

To understand the dialogue we must know something about its author, Cicero, and its leading character, Cato.

Cicero was a contemporary of Julius Caesar in the first century B. C. He had been active in law and politics in the troubled period during which Caesar obtained dictatorial power in Rome for a few years and then was murdered. Those who came to power after Caesar were hostile to Cicero. He took refuge in writing on oratory, ethics, and other subjects, and wrote his dialogue on old age when he was 62. A year later he was put to death by his enemies.

To exemplify old age at its best Cicero chose Cato the Elder, a Roman soldier and statesman of nearly two centuries earlier. It is as if some one today should choose Washington or Franklin to take the lead in a dialogue. Cato had risen from the rank of private in the army to that of an important general. He later held high political offices. It is he who for many years ended every speech with the words, "It is my judgment that Carthage should be destroyed." He published writings on law, history, and agriculture, besides many speeches. He died at the age of 85 in the year 149 B. C. In the dialogue he is represented as talking with two younger contemporaries, still in their thirties, who afterwards became famous.

At the opening of the dialogue Cato's young friends express their surprise and admiration at the fact that old age is never burdensome to him, "though it is so vexatious to most old men that they declare it to be a burden heavier than Mt. Aetna" (2, chapter 2, section 4). He replies that "to those who have not the means within themselves of a virtuous and happy life every age is burdensome, and, on the other hand, to those who seek all goods within themselves, nothing can seem evil that the laws of Nature inevitably impose." He expresses the conviction that Nature is "the best of guides" and "since she has fitly planned the other acts of life's drama, it is not likely that she has neglected the final act as if she were a careless playwright." A final phase of life is needed in which one is like ripe fruit ready to fall, and "this state the wise man should endure with resignation" (2, chapter 2, section 4–5).

Cato criticizes some old friends of his who lamented because "they were denied the sensual pleasures without which they thought life not life at all," or "because they were scorned by the people who had been accus-

Dr. Chandler received his M.A. degree from Dartmouth College in 1909, another M.A. degree and his Ph.D. degree from Harvard in 1913. He was assistant in philosophy at Harvard from 1912 to 1913, instructor from 1913 to 1914, assistant professor of philosophy at Ohio State University from 1914 to 1925, professor since 1925, and visiting associate professor of philosophy, New York University, 1924–1925.

tomed to pay court to them." He contrasts these with other old men who seem happy, and attributes the difference between the two groups to their character. He says that "old men of self-control, who are neither churlish nor ungracious, find old age endurable; while on the other hand perversity and an unkindly disposition render irksome every period of life" (2, ch. 3, sec. 7). He maintains that "the most suitable defences of old age are the principles and the practice of the virtues." If the virtues are cultivated at every period of life they "bring forth wonderful fruits at the close of a long and busy career . . . . It is most delightful to have the consciousness of a life well spent and the memory of many deeds worthily performed" (2, ch. 3, sec. 9).

A more formal discussion now begins with the mention of "four reasons why old age appears to be unhappy; first, that it withdraws us from active pursuits; second, that it makes the body weaker; third, that it deprives us of almost all physical pleasures; and fourth, that it is not far removed from death" (2, ch. 5, sec. 15).

The withdrawal from active pursuits applies only to vigorous bodily activities. There are "intellectual employments in which aged men may engage, even though their bodies are infirm." He mentions various old men, well known to his hearers, who "by their wisdom and influence . . . were preserving the state." The pilot on a ship who "sits quietly in the stern and simply holds the tiller" is doing something "better and much more important" than the youngsters who are "climbing the masts . . . or working at the pumps." "It is not by muscle, speed, or physical dexterity that great things are achieved, but by reflection, force of character and judgment" —qualities in which old age is usually superior to youth (2, ch. 6, sec. 15–17).

Cato then takes up the accusation that old people lose their memory. He replies that if they do so it is because they neglect to exercise it, and adds, "I certainly never heard of an old man forgetting where he had hidden his money! The aged remember everything that interests them, their appointments to appear in court, and who are their creditors and who are their debtors." In general, he concludes that "old men retain their mental faculties provided their interest and application continue" (2, ch. 7, sec. 21–22). A modern psychologist would agree that interest and application are powerful aids to memory and understanding.

Cato argues that the old need not be boresome to youth. The old take delight in the company of witty youths and the latter "find pleasure in the company of their elders, by whose precepts they are led into virtue's paths" (2, ch. 8, sec. 26). Notice that it is an *old* man who says this!

In a passage often mentioned, Cato speaks of old men who "go on adding to their knowledge" and continues, "in my old age I have learned Greek, which I seized upon as eagerly as if I had been desirous of satisfying a long-continued thirst, with the result that I have acquired first-hand the information that you see me using in this discussion by way of illustration" (2, ch. 8, sec. 26). To understand Cato's enthusiasm for Greek as depicted by Cicero, we must remember that in those centuries there was very little literature, science, philosophy, or poetry in Latin, while the most valuable Greek works had already been written but had not been translated. Without Greek one could not become a learned man.

The second accusation against old age was that it lacked the strength of youth. To this Cato replies that he does not feel the need of it, any more than in youth he felt the need of the strength of a bull or an elephant. He admits that in oratory the old man lacks the lung power of youth. Still, the old man's voice has a certain resonance, and "very often the sedate and mild speaking of an old

man wins itself a hearing." Furthermore, the old man may teach younger orators (2, ch. 9, sec. 27–29).

Cato points out that some old men retain a goodly amount of physical strength and asserts that those who have not been dissipated in youth are likely to retain their vigor. He himself is strong enough in his eighties to speak in the Senate and before the popular assembly, and to receive at his home all who wish an interview with him (2, ch. 9, sec. 30, and ch. 10, sec. 32).

Cato proudly lists his own activities. "I am now at work on the seventh volume of my *Antiquities*. I am collecting all the records of our ancient history, and at the present moment I am revising all the speeches made by me in notable cases which I conducted. I am investigating the augural, pontifical, and secular law; I also devote much of my time to Greek literature; and, in order to exercise my memory, I follow the practice of the Pythagoreans and run over in my mind every evening all that I have heard, said or done during the day . . . . I act as counsel for my friends. I frequently attend the senate, where, on my own motion, I propose subjects for discussion after having pondered over them seriously and long; and there I maintain my views in debate, not with strength of body but with force of mind . . . ." (2, ch. 11, sec. 38). Thus Cato's own experience proves that one can be active in old age.

He bids his friends "enjoy the blessing of strength while you have it and do not bewail it when it is gone." He continues, "Life's race-course is fixed; Nature has only a single path and that path is run but once, and to each stage of existence has been allotted its own appropriate quality; so that the weakness of childhood, the impetuosity of youth, the seriousness of middle life, the maturity of old age—each bears some of Nature's fruit, which must be garnered in its own season" (2, ch. 10, sec. 33).

This is perhaps the best sentence in the dialogue. However, Cicero's indication of the quality of each age is far too simple. Childhood has other qualities besides weakness; youth has other qualities besides impetuosity. Maturity, which he attributes to old age, is much too vague. But modern psychology still lacks a thorough analysis of changes in personality through maturity and old age (4).

"We come now," he says, "to the third ground for abusing old age, and that is, that it is devoid of sensual pleasures. O glorious boon of age, if it does indeed free us from youth's most vicious fault!" He argues in a Puritanical tone that lust leads to folly and crime; also, man has received no more excellent gift than intellect, and intellect "has no deadlier foe than pleasure" (2, ch. 12, sec. 39–40).

Cato refuses to attack all pleasure, as some philosophers had done. Instead he tells of various harmless pleasures which he approves and enjoys. One of these is dining with friends, in which he enjoys the conversation at least as much as the food (2, ch. 13, sec. 44 to ch. 14, sec. 46).

Cato continues, "I come now to the pleasures of agriculture in which I find incredible delight; they are not one whit checked by old age, and are, it seems to me, in the highest degree suited to the life of the wise man" (2, ch. 15, sec. 51). He goes into great detail about various aspects of farming (2, ch. 15, sec. 51, to ch. 17, sec. 60). He is "inclined to think that no life can be happier than that of the farmer, not merely from the standpoint of the duty performed, which benefits the whole human race, but also because of its charm already mentioned, and the plenty and abundance it gives of everything that tends to the nurture of man and even to the worship of the gods" (2, ch. 16, sec. 56). In reading this praise of farming, we must remember that Cato belonged to a land-holding aristocracy. No doubt he enjoyed planning and supervising the activities on his lands, but he did not have to do any physical labor unless he took a notion to do so.

The final source of pleasure which he mentions is influence (*auctoritas*: authority, influence, prestige), which he calls "the crowning glory of old age." "Surely old age, when crowned with public honors, is of more account than all the sensual pleasures of youth." He reminds us "that in this entire discussion I am praising that old age which

has its foundation well laid in youth. . . . When the preceding part of life has been nobly spent, old age gathers the fruits of influence at the last. For those very things that seem light and trivial, are marks of honor—the morning visit, being sought after, being made way for, having people rise at one's approach, being escorted to and from the forum, being asked for advice—civilities most scrupulously observed among us and in every other state in proportion as its morals are good" (2, ch. 17, sec. 61, to ch. 18, sec. 63).

At this point Cato injects his comments on certain other accusations against the aged. They are said to be "morose, troubled, fretful, and hard to please; and, if we inquire, we find that some of them are misers too. However, these are the faults of character, not of age." Yet moroseness and the other faults mentioned have at least a partial excuse "in that old men imagine themselves ignored, despised, and mocked at; besides, when the body is weak, the lightest blow gives pain. . . . But nevertheless all these faults are much ameliorated by good habits and by education. . . . Indeed the case stands thus: as it is not every wine, so it is not every disposition, that grows sour with age" (2, ch. 18, sec. 65).

The fourth objection to old age was the nearness of death. Cato exclaims, "O wretched indeed is that old man who has not learned in the course of his long life that death should be held of no account! For clearly death is negligible, if it utterly annihilates the soul, or even desirable, if it conducts the soul to some place where it can live forever" (2, ch. 19, sec. 66).

Death comes more gently to the aged than to the young. ". . . just as apples when they are green are with difficulty plucked from the tree, but when ripe and mellow fall of themselves, so, with the young, death comes as a result of force, while in the old it is a result of ripeness. To me, indeed, the thought of this 'ripeness' for death is so pleasant, that the nearer I approach death the more I feel like one who is in sight of land at last and is about to anchor in his home port after a long voyage" (2, ch. 19, sec. 71).

Through concern for right living and indifference to death, old men may actually become "more spirited and courageous than youth. This explains the answer which Solon gave to the tyrant Pisistratus who asked, 'Pray, what do you rely on in opposing me so boldly?' and Solon replied, 'Old age'" (2, ch. 20, sec. 72).

Cato thinks that the course of life prepares us for death. ". . . satiety of all pursuits causes satiety of life. Boyhood has certain pursuits; does youth yearn for them? Early youth has its pursuits; does the matured or so-called middle stage of life need them? Maturity, too, has such as are not even sought in old age, and finally, there are those suitable to old age. Therefore as the pleasures and pursuits of the earlier periods of life fall away, so also do those of old age; and when that happens man has had his fill of life and the time is ripe for him to go" (2, ch. 20, sec. 76).

Cato now casts aside his previous caution and declares that he accepts the arguments for immortality. He tells his young friends of his conviction that their fathers, who were also his friends, "are living yet, and living the only life deserving of the name. For while we are shut up within these frames of flesh we perform a sort of task imposed by fate and endure grievous labor; for the soul is celestial, brought down from its exalted home and buried, as it were, in earth, a place uncongenial to its divine and eternal nature. But I believe that the immortal gods implanted souls in human bodies so as to have beings who would care for the earth and who, while contemplating the celestial order, would imitate it in the moderation and consistency of their lives" (2, ch. 21, sec. 77). This passage is closely akin to Plato's doctrines.

Modern psychologists tread gingerly in this area, but the effects of belief or disbelief in various conceptions of immortality are a legitimate topic for investigation.

After elaborating his doctrine of immortality, Cato rises to a still higher pitch of enthusiasm, exclaiming, "O glorious day, when I shall set out to join the assembled hosts of souls divine and leave this world of strife and sin! For I shall go to meet not only the men

already mentioned, but my son Cato, too, than whom no better man, none more distinguished for filial duty, was ever born. . . . People think that I have bravely borne my loss—not that I bore it with an untroubled heart, but I found constant solace in the thought that our separation would not be long. For these reasons . . . my old age sits light upon me . . . and not only is not burdensome, but is even happy" (2, ch. 23, sec. 84–85). On this note of serenity and hope the dialogue comes to a close.

The *De Senectute,* which is more than three times as long as the preceding summary of it, contains many valuable ideas that I could not even hint at here. But we have before us, at least in outline, Cicero's ideal of a serene but active old age. Let us compare it with the views of Aristotle and those of a twentieth-century psychologist.

Cicero's dialogue is very different from Aristotle's depiction of old age, which I discussed in a previous article (1). Aristotle gave a shrewd and cynical account of old men as he saw them. Cicero sought to console and prepare both himself and others for the approach of age by showing what old age might be at its best. He made things easy for himself by imputing to Cato exceptional physical and mental vigor, ample wealth, a high position in the state, and a strong faith in immortality. Neither Aristotle nor Cicero deigned to give any thought to the problems of older *women.*

George Lawton, in *Aging Successfully,* lists twenty traits that a well-adjusted person should have, regardless of age or sex (3, p. 213). At the end of the same book he offers "Ten Hints on Aging Successfully" (3, p. 265). Cicero's Cato conforms very closely to nearly all the standards set up by the modern psychologist. Most of what Lawton expresses in general terms is concretely depicted in the literary portrait of Cato. Lawton's general statements have the advantage of being helpful to the average man or woman, who lacks Cato's special talents and opportunities. Cato, on the other hand, does not merely conform to a general standard; he has a clear-cut individuality of his own. His stern zeal for patriotism and morality is balanced by his affability to his young friends, his occasional wit, his delight in agriculture, and his tender references to his son.

Cicero anticipates many insights of modern psychology, but he also gives a masterly portrait of a unique character. His dialogue deserves its reputation as the finest literary treatment of its theme.

Summary

According to Cicero an ideal old age is characterized by (a) physical vigor and (b) strength and amiability of character, both having been achieved through right living in youth and middle age, (c) intellectual activity, (d) services to friends and community, (e) reduction or disappearance of the sex drive, thus removing what is described as a major obstacle to rational living, (f) acceptance of normal changes due to age, (g) the enjoyment of harmless social pleasures and (h) of agriculture, (i) the satisfaction and prestige derived from past achievements and present character, (j) indifference to death, and (k) faith in immortality. There is little in the dialogue that conflicts with modern psychology and much that anticipates modern psychologic insights.

This article is based on a broadcast given in the winter of 1947–1948 over station WOSU of Ohio State University in a series on Philosophy for Later Years.

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Submitted for publication May 25, 1948
The author's address is:
Dr. Albert R. Chandler
Department of Philosophy
Ohio State University
Columbus 10, Ohio

CURRENT COMMENT

Economic Aspects of Pension Plans

Not only do old age pension plans have a social aspect; they have an economic one as well. As an example, in November the people of Oregon voted a pension of $50 monthly, to be paid regardless of the recipient's need.

The Associated Press commented, "Oregonians then learned their pension plan might cost as much as $9,000,000 a month—three times what the state spends now on all its activities. Furthermore, no provision has been made to finance the pensions.

"Even the Townsend Club sponsors of the pension plan were contrite. 'It wasn't what we intended. We don't want to bankrupt the state,' their spokesman said, adding, 'We will ask the next Legislature to change the law.' "

Association for Successful Aging

As a result of the interest evoked by a course of lectures "Aging Successfully" given by Dr. George Lawton in 1946-1947, the Association for Successful Aging was organized in New York City. To promote successful aging in the community the Association aims to:

1. Serve as a forum for the discussion of all the issues involved in successful aging.
2. Serve as an educational group.
3. Establish and/or encourage the establishment of definite types of model projects in successful aging.
4. Serve as a vehicle for the cooperative thinking of members of the association, to aid them in planning for their own successful aging through a joint study of the most effective patterns of living in later maturity: occupation, budget planning, insurance, housing, medical care, recreation, social contacts, etc.
5. Offer the membership a chance to be active in a socially useful group, and, therefore, help them at the present stage of their lives.

Dr. Lawton believes that by focussing the energies and interests of people in different communities on constructive things that can be done with the problems of aging, much can be achieved in the direction of a fuller psychologic and medical program.

The Association for Successful Aging hopes to be the source in the community of new and workable ideas, of practical procedures that will fit into the general picture of community life, and of educational campaigns—not to glorify old age or give older persons special privileges, economic or otherwise—but to fill the second forty years with as many satisfying, happy, and useful experiences as the first forty. The ages of members range from 28 to 85, with the average age in the middle forties.

The association holds ten monthly dinner meetings a year at which an authority in the field of aging speaks; this is followed by discussion and a business meeting. Further de-

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The hieroglyphics, "The Beginning of the Book for Transforming an Old Man into a Youth," at the top of this editorial page, are from the Edwin Smith Surgical Papyrus, translated by Professor John Breasted, University of Chicago Press.

tails and an application blank can be had by writing to the secretary, Miss Beatrice Blum, 1057 Faile Street, New York 59, New York.

Veterans' Pensions

The old-age pension proposals made at the American Legion convention in October eventually could cost the government as much as six billion dollars a year, according to estimates of the Veterans Administration, and more than one billion would be added to the agency's annual budget immediately if the proposals were approved by Congress. They call for monthly checks of $60 to all veterans of both wars over 55 years old, and payment of $75 a month to those over 65.

Government Reports

The Labor Department reports that industrial absenteeism is lowest for men and women over 45 years old. Workers under 20 have the highest absentee rate, and the rate declines as the worker grows older. Older workers have fewer injuries, but it takes them longer to recover. These findings were based on a six months' survey of 17,800 men and 1309 women of all ages in 109 manufacturing plants.

And the National Office of Vital Statistics reports that for the first time in the country's history the life expectancy rate has gone past the biblical three score and ten. White girl babies born now can expect to live at least 70.3 years, and white boy babies can expect to live on the average of 65.1 years. Non-white girl babies have the chance of living at least 61 years, and non-white boy babies have an expectancy of 57.5 years.

Argentina's Decalog for Elders

Señora Eva Perón, wife of President Perón, in a speech at a ceremony in the Ministry of Labor and Welfare, enumerated ten rights for old people: public assistance, shelter, food, clothing, physical care, moral care, recreation, work where possible, peace of mind, and respect of their fellowmen.

She expressed the hope that "These very rights which we proclaim today, expounded before the nations of the world, may serve as an inspiration and eventually as blessing to all the helpless aged of the earth."

Coffee and Longevity

According to experiments made in the nutrition laboratory of Cornell's department of animal nutrition, rats which all their lives had nothing to drink except coffee lived as long and well as animals that never tasted the stimulant; the rats, however, took only as much as they wanted to satisfy thirst.

In addition, three diets, all as nearly like human food as possible, were fed to three separate groups of rats, all their lives, and for three successive generations. One diet resembled the average human diet, one was considered a better human diet, and the third had supplements of vitamins. However, none of the diets lengthened or shortened lives.

The Happiest Time of Life

Dr. Raymond G. Kullen of Syracuse University conducted an investigation to determine the happiest time of life, using as subjects 300 persons, aged from 20 to over 80 years. These people rated the age 20 to 30 the happiest time, but most of them also said that more of their unhappy times were also concentrated in the same ten years. Dr. Kullen has concluded that problems of the decade from 20 to 30 needs psychologic studies like those which have been done on the difficulties of adolescence.

The Last G.A.R. Encampment

The six delegates to the 1948 encampment of the Grand Army of the Republic decided they were too old and the G.A.R.'s ranks too

thin for any further encampments beyond 1949. There will be just one more formal meeting for the 28 surviving members. However, there are still some hardy members.

James A. Hard, 107 years old, the oldest one, sat up and smoked a cigar forty-eight hours after he had been admitted to the hospital in a serious condition suffering from pneumonia. "His recuperative powers are nothing short of amazing," commented a house physician.

Elders in the News

Two more recipes for a long life: "Old Mag" Frisby, Negro, Whiteford, Maryland, said that her daily gallon and a half of water was the secret of her longevity. As close as can be figured, she was 110 when she died in October.

Uncle Walter Morrison, who says he was born in slavery in Virginia 100 years ago, gives as his recipe for a long life—"When I works, I works hard. When I sits, I just sits relaxed. When I start worrying, I just fall asleep."

* * *

Robert Woldridge, 94 years old, of Leeds, England, broke into a factory and eluded police by hurdling a five-foot wall and dropping fourteen feet to the ground on the other side. But the judge let him off—that was the one thing that had not happened to Woldridge during a long life.

* * *

And among the recipes for a long life there is the one by George Bernard Shaw, 92 years old this year. He gives the credit to his vegetarian diet, the fact that he is a teetotaler, and to his extremely careful rules of living.

* * *

And for romance we have George W. Sears, 91 years old, and Mrs. Martha Williams, 72, of Monterey Park, California, who were married in October. The romance began with an advertisement in an old-age pension magazine.

A seventieth wedding anniversary was celebrated this year by Jerry Pope, 91 years old, and his wife, Alice, 86, of Bingham, Illinois. The couple is active and neither member wears glasses. She gardens and cans the produce. At 90, he remodeled their five-room home and dug a new well.

* * *

On the lists of "firsts" there is Michael Cavanaugh, Freeport, Maine, who saw his first motion picture at the age of 88. It took a lot of coaxing but he consented to go with his 75-year-old wife as part of their 55th wedding anniversary. He liked it.

John Fitzgerald, 84, of California, who believes that life begins at 70, made a concert debut as a singer in Town Hall in September.

Walter Morgan, a 76-year-old farmer, Fosston, Minnesota, made his first parachute jump just "to show the youngsters what an old man can do," and made a perfect landing. "That's what an old man can do if he leaves liquor alone," he said. He plans to make more jumps.

* * *

According to Ripley, Mrs. Barbara Singleton, Wilkinsburg, Pennsylvania, is an enthusiastic bowler at the age of 85.

* * *

Ivy Baldwin, who retired as a daredevil trapeze artist twenty years ago, celebrated his eighty-second birthday by walking a cable stretched 125 feet above South Boulder creek near Eldorado Springs, Colorado. Baldwin had made the 300-foot crossing 86 times before retiring in 1928.

* * *

Mrs. R. C. Branan, who is 71 years old, and her 69-year-old husband, are building their sixteenth house in Atlanta, Georgia, doing all the work themselves except the plumbing and electrical installations. Each is partly crippled and each uses a crutch, but they can still lay brick and raise joists with the best of them.

* * *

In October, 1929, Sam Hinds, 74, was a retired lawyer living comfortably in Pasadena with his million dollar fortune in oil stocks. After the stock market crashed he found himself completely broke and con-

fronted with the necessity of getting a job. He turned to the films and has made a successful career for himself as an actor. Which proves that a new career can be started after 60.

* * *

At 60, Mrs. Mabel Start, veteran animal trainer, Thousand Oaks, California, was able to finish her circus act even though she was badly clawed by the tigers.

* * *

News and Notes

The annual meeting of the American Society for the Study of Arteriosclerosis was held in Chicago October 31 and November 1, 1948, at the Hotel Knickerbocker in Chicago. Twenty-six papers dealing with aspects of experimental and clinical arteriosclerosis were presented. Abstracts of the proceedings have been published in the *American Heart Journal, 36:* 466–480, 1948.

Dr. Florence Moog, assistant professor of zoology at Washington University, St. Louis, was named winner of a $1000 George Westinghouse Science Writing Award. Her article, "The Biology of Old Age," which appeared in the June issue of *Scientific American,* was adjudged the best of 102 entries in the magazine field.

In addition to editorial material placed in this section, the JOURNAL OF GERONTOLOGY will accept notices of positions open.

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Second Gerontologic Conference of the British Society For Research On Ageing

V. KORENCHEVSKY

The Conference was held on July 17, 1948, in the premises of the Royal Society of Medicine, London. The following guests were present from the European Gerontological Societies:

1) Professor M. Beltrán-Báguena, Valencia University.

2) Dr. F. Bourlière, Paris University.

3) Dr. E. Divry, Liège University.

4) Dr. E. Jacobsen, Copenhagen.

5) Dr. H. Suomalainen, Helsinki University.

Professor F. Crew was the Chairman of the Conference, Professor E. C. Dodds, Vice-Chairman, and Dr. V. Korenchevsky, Hon. Secretary.

The aim of the Conference was to review the present research activity of the members of the Society, whose research has already given some definite results.

Summaries of the addresses given are as follows:—

1. *The First Eighteen Months of the Cambridge Nuffield Research Unit on Ageing.* BARTLETT, Sir Frederick, Cambridge Nuffield Unit for Research on Ageing, Department of Psychology, Cambridge University.

There were considerable unavoidable delays in the provision of satisfactory working conditions for the research unit, and although the Unit has now been in operation for eighteen months, only since January of the present year has it had proper accommodation. Consequently all the conclusions, which appear to be indicated, must be considered provisional.

The aim of the Unit is to make a direct, but controlled, study of human behaviour within wide limits of age-range groups. It was thought possible that there may be limiting ages within which changes, especially in the ways in which psychophysical skills, with or without much muscular effort, may be carried out. The first thing necessary, therefore, was to de-

velop experimental methods by which skilled operations of some complexity containing a number of contributing functions could be scored or assessed for overall efficiency or productivity, and at the same time their contributory functions could be scored or assessed and the internal relationships of these functions recorded. This has been achieved for a number of operations, though so far no attempt has been made to study performance involving heavy muscular effort.

The following conclusions, all subject to further investigation, seem likely to be demonstrable:

(a) There is very little evidence of any important and necessary age-range group variation in overall efficiency of performance of light psychophysical skill during what may be regarded as the normal working life of 18 to 60+ years.

(b) At the same time there may be considerable and significant changes in the ways in which efficiency is maintained and in the internal relationships of the contributory functions involved.

(c) These changes may be most marked at critical age-range periods, one in the late 20's to middle 30's and another perhaps in the late 40's to middle 50's, with a following pick up of overall performance when adaptation supervenes.

(d) The most important changes may be:
- (i) Somewhat more deliberate methods at the beginning of a work cycle;
- (ii) Slight lengthening of intervals between the finish of one component movement of a complex skill and the beginning of the next;
- (iii) Increased tendency to continue to rely upon perceptual guidance (especially perhaps, visual guidance) even when the motor components of a skill have become thoroughly established;
- (iv) Possibly a tendency, especially in mental work proper, to assimilate a new situation to one already well established, at the risk of ignoring detail peculiar to the new situation.

(e) A general effect of these changes appears to be a lengthening of adaptation rate, both as regards the warming up which characterises particular working spells, and as regards the settling down which longer term habituation to new forms of continued exercise demands.

2. *The Use of Stilbestrol in the Treatment of Malignant Diseases in the Aged.* DODDS, E. C., Courtauld Institute of Biochemistry, Middlesex Hospital, London.

Professor Dodds reviewed the connection between the internal secretion of the testes and the development of the prostate and called attention to the importance of the work of Huggins and his school at Chicago.

Using the acid serum phosphatase as the method of assessing the degree of androgen secretion, Huggins was able to show that an increase in acid serum phosphatase was invariably associated with carcinoma of the prostate, particularly in the presence of metastases. Whereas the older workers reduced the androgen secretion by castration, Huggins, applying the modern methods of endocrinology, was able to obtain the same effects by the oral administration of stilboestrol. This substance appears to produce its beneficial effect by inhibiting the secretion of the anterior lobe of the pituitary.

It was stated that under no circumstances could the treatment be regarded as a cure, although the symptomatic relief was dramatic and valuable.

The use of synthetic oestrogens in other forms of malignant disease was also reviewed, and it was pointed out that a certain percentage of success has been obtained in cases of carcinoma of the breast in elderly people.

Reference

Dodds, E. C.: The Present Position of Hormone Therapy in the Treatment of Cancer. *Tr., M. Soc. London, 64:* 239–244, 1943–1946.

3. *The Effects of Sex and Thyroid Hormones on Some Features of Ageing in Adult and Senescent Normal Female Rats.* KORENCHEVSKY, V., Oxford Gerontological Research Unit, Oxford.

In the previous experiments these effects were studied in ovariectomised rats. In the present report are given the preliminary results obtained in four experiments on normal female rats, adult animals 10 to 15 months and senescent rats 24 to 27 months.

Androgenic hormones produced hypoplasia of the hypophysis and, probably because of this, hypoplasia of the ovaries as well. As the result of hypoplasia of the ovaries atrophy of the uterus developed after androsterone injections; the vagina, however, remained of about normal size and weight, and the preputial glands became hypertrophied. On the contrary, administration of testosterone propionate produced hypertrophy of the uterus and vagina; the preputial glands also became much hypertrophied.

This difference in action between androsterone and testosterone propionate can be explained by the fact that androsterone has a direct stimulating effect, of medium degree, on the vagina, and a strong effect on preputial glands but only a very slight effect on some tissues of the uterus. A strong direct stimulating effect of testosterone propionate is produced on all three organs.

In general, the stimulating effect of androgens and oestrogens on the liver, kidneys, spleen and heart in

normal rats is much weaker, or even often absent, as compared with their definite hypertrophing action on some or all of these organs in ovariectomised animals.

As in spayed rats, the androgenic hormones produced a hypoplasia of adrenals which could be neutralised by simultaneous administration of oestrogenic or thyroid hormones.

Compared with the effect of a single hormone, plurihormonal treatment with androsterone, oestradiol, progesterone, and thyroid hormone in the doses used produced in general a greater stimulating action on the liver, kidneys, spleen, and heart; it neutralised the hypoplastic effect of androgens on the adrenals, and in some cases it partially neutralized the hypophysis; however, it was unable to neutralise the androgenic atrophy of the ovary.

Thus, as in the case of ovariectomised rats, in adult and senescent normal rats the plurihormonal treatment produced a statistically significant return of the relative weights of some organs towards the level observed in younger animals, but this action appeared to be weaker in normal than in ovariectomised animals.

Thus, as far as our preliminary investigation of the results obtained shows, together with the hypertrophying and apparently useful effect on some organs, the plurihormonal treatment, with the hormones and doses used, simultaneously produced hypoplasia of the hypophysis and ovaries. Therefore, this treatment could not be considered as being favourable on the whole process of aging hypoplasia in normal adult and senescent female rats. Especially damaging in this respect were androgenic hormones. It is necessary, however to emphasize that the doses used were comparatively large for such a small animal as the rat. Small doses and a more complete natural combination of hormones (e.g. addition of anterior lobe hormones) might give different results.

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4. *The Gerontological Aspects of Atheroma.* GEIRINGER, E., Edinburgh Gerontological Research Unit, Edinburgh University.

A study of 400 aortae and a detailed analysis of 180 of these revealed the following points:

1) Atheroma of the aorta is invariably present after the age of eight. It is therefore to be regarded as a racial characteristic of mankind unless and until it can be shown to be due to an extraneous and only temporarily active factor. It is caused by the effect of normal blood-pressure on the normal aortic wall thus furnishing an example of the pathogenetic action of normal function. Clinically significant lesions do not as a rule occur before the age of 30, which explains how this defect in our organisation has escaped the corrective action of natural selection. Even after the age of 30 uncomplicated atheroma is a mild and trivial condition, increasing only very gradually in severity as age advances.

It provides, however, a favourable soil on which complications arise in a great number of cases transforming it from a harmless into a dangerous and often deadly disease. The two major complicating conditions of atheroma are hypertension and excessive calcification.

In all these features we discern a distinctive pattern of pathologic behaviour which I believe to be characteristic of the phenomena of senescence.

5. *Ageing of Lymphoid Tissue.* DENZ, F. A., Department of Morbid Anatomy, University College, London.

Owing to the wide dispersion of the lymphoid tissue of the body, age changes can be followed only in representatives of the main anatomical types. In general, the age changes in lymph nodes, tonsils, thymus, spleen, Peyer's patches, and appendix are very similar. Growth is rapid for the first few years of life, a maximum size is attained in childhood, a decline sets in at puberty, and in the adult the lymphoid tissue decreases slowly and irregularly. The lymphoid tissue can always be stimulated to hypertrophy by local or general infections. These changes can be associated with the function of lymphoid tissue to produce immune bodies. The amount of lymphoid tissue can be equated to the need for antibody production, greatest in childhood and least in old age.

There are exceptions to these general growth changes in lymphoid tissue. The amount of lymphoid tissue in the lung increases steadily throughout life. This may be a consequence of the increased tendency to respiratory infections with increase in age. In old age other tissues such as the thyroid, breast, bone marrow, uterus, and striated muscle develop nodules

of lymphoid tissue whose presence cannot be accounted for so easily. There is probably not much change in the total amount of lymphoid tissue in the body in adult life, although its distribution may change somewhat. Any decline in the amount of lymphoid tissue is probably an indication of the absence of antigenic stimuli rather than a consequence of any primary effect of aging.

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6. *Radiology of the Small Intestine in Old Age.* JUNGMANN, H. J., and COSIN, L., Orsett Lodge Hospital, Essex.

When performing follow through examinations in cases of suspected peptic ulcer in old people, our attention was drawn to radiologic changes in the small intestine, which we considered to be pathologic, but for which we could find no reason on clinical grounds. This prompted a systematic examination of the small intestine in old people as seen in serial roentgenograms, the results of which are given in this study.

A preliminary lateral roentgenogram of the abdomen was obtained to ascertain the degree of calcification of the abdominal aorta. Only patients without symptoms referable to the gastro-intestinal tract were examined. Apart from our studies on old people we used the same technique on a number of young and adult persons to test our methods and to compare our results with those described by other authors.

The small intestine, physiologically a very active organ, is sensitive to many stimuli; it has therefore, the disadvantage of a constantly varying appearance which makes the analysis of serial changes very difficult. It has, however, been possible, thanks to the work of the American authors (Pendergrass, Ross Golden, Chamberlin), to establish certain physiologic standards and to recognise them as characteristic for normal adults.

Deviations for this normally occurring pattern are found in conditions Ross Golden calls nutritional disorders, which include avitaminosis caused by lack of vitamin B, hypoproteinaemia, food allergy, and a number of tropical diseases. To these clinical types must be added the similar observations of Gutzeit on patients with jaundice, of Vespigiani on patients with the so-called sclerosing mesenteritis and of Heilbrun on the conditions following the excessive use of cathartics. In some cases the changes are reputedly reversible with a restoration of the normal intestinal pattern. It would appear that the hypertonic stage precedes the hypotonic, and is more amenable to treatment.

Our radiologic findings in old people would appear to correspond completely with those Ross Golden described as typical of nutritional disorder. Moreover, as this authority considers that hypermotility and hypertonicity are the earliest and reversible radiologic variations, it would appear that most of our cases fall into this group; the temporary character of these abnormalities strengthens this view. Relatively few of our cases showed the more advanced changes—in the American classification—of segmentation, hypotonicity, hypomotility, scattering, and mucosal atrophy or hypertrophy. This can be explained by our patients having recovered from their temporary indisposition, which was not gastro-intestinal in origin. It would appear, therefore, that these radiologic abnormalities in the small intestine, previously considered characteristic of gastro-intestinal disease, are observed very frequently in geriatric practice.

There only remains the discussion of Ross Golden's hypothesis of these radiologic abnormalities being caused by functional, or demonstrable pathologic lesions of the intramural or submucosal nervous plexi. This hypothesis could be applied to our cases also in view of the frequency of a diminished blood supply, due to arteriosclerosis, in this part of the body, resulting in anoxia to the nerve cells of Meissner's and Auerbach's plexus. The possible part played by hypovitaminosis associated with malabsorption has also to be defined. Clinically there was no evidence of this in our cases.

Finally we advance a hypothesis based on Cannon's theory of the nervous control of the gastro-intestinal tract by pontine centres—the very frequent incidence of cerebral arteriosclerosis, with its resultant intermittent cerebral anoxia, in old patients may be connected with the changes in the small intestine we have described.

7. *Renal Function in the Aged Male.* OLBRICH, O., BROWN, H., and FERGUSON, M. H., Biochemical Laboratory, Royal Infirmary, and Queensberry House Hospital, Edinburgh.

The renal function of the aged male has been investigated by the method of inulin and diodrast clearances. The drip infusion and the intravenous injection of diodrast and inulin methods were compared in 16 patients, and, as no significant difference was found, further subjects were investigated with the double injection method only.

At the same time normal controls were used in the age group 20-40.

The glomerular filtration rate was found to be 125.6 cc. per minute in the normal male, whereas in the aged males with high systolic pressure it was 100.7 cc. per minute, and in the aged males with high systolic and high diastolic pressure 80 cc. per minute.

The renal plasma flow was found to be 613 cc. per minute in the normal male, whereas in the aged males with high systolic pressure it was 418 cc. per minute,

and in the aged males with high systolic and high diastolic pressure 337 cc. per minute.

The earliest characteristic impairment of renal function in the aged male is a gradual decrease of the renal plasma flow and, concomitantly, a decrease of the maximal tubular excretory capacity, i.e., tubular function.

The maximal tubular excretory capacity of the normal males was found to be 47.6 mgm. iodine per minute, whereas in the aged males with high systolic pressure it was 35.8 mgm. iodine per minute and in the aged males with high systolic and high diastolic pressure 28.3 mgm. iodine per minute.

The amount of plasma filtered by the glomerulus in relation to the amount of blood flowing through the kidneys is increased in the aged male, as indicated by the filtration fraction. The increase of the filtration fraction is already shown in the group with high systolic pressure. This increase is explained by the gradual decrease with advancing years of the plasma protein fractions, especially of the albumin and globulin fractions. With decreasing plasma proteins the colloid osmotic pressure decreases and the glomerular filtrate increases.

It is also demonstrated in 8 patients that there is an increase in the urea clearance, which is higher in these subjects than the glomerular filtration rate measured by inulin. This increased urea clearance is explained by the tubular excretion of urea as well as filtration.

8. *The Electrocardiography of the Geriatric Patient.* MILLER, R. M., Orsett Lodge Hospital, Essex.

Dr. R. M. Miller has examined the electrocardiograms of a series of old patients who underwent functional rehabilitation under the direction of Dr. L. Cosin.

He has produced much evidence to show that major electrocardiogram changes are present in over 60 per cent of these patients, who did not display clinical evidence of cardiac failure, since this group had been previously excluded. He, therefore, strongly supports the view that major electrocardiogram changes alone should not contra-indicate the functional rehabilitation of the geriatric patient.

Detailed results and comments will be the subject of a M.D. thesis to be published shortly.

9. *Recent Gerontological Activity in Denmark.* JACOBSEN, E., Copenhagen.

The Danish Society for Research on Ageing consists now of 15 members. Interest in gerontology is increasing in Denmark, as illustrated, for example, by the sale of Dr. Jacobsen's (7) book on old age. In the first six months after publication several thousands of copies have been sold, and the book has been widely commented on and referred to in the Danish daily and medical press.

The following publications illustrate gerontologic research activities of the Danish Society during 1943 to 1947.

Orla-Jensen, Erik Olsen, and Torben Geill (8) showed that the older and more senile a human being becomes the more predominant are the putrefaction bacteria in the intestine at the expense of the lactic acid bacteria. The result seemed mainly to be due to decreased acidity of the stomach content in old people.

Bock (2) investigated the concentration of serum protein in a number of aged people and found a decrease of about 0.3 per cent in normal persons over 79 years old.

H. O. Bang (1) found no decrease in the serum thiamine content in old age, while Daubenmerkl (3) showed a marked decrease in the urinary output of riboflavine.

Schmidt (9) found no difference between the excretion of pantothenic acid in young and old persons.

Hamburger, Halvorsen, and Pedersen (5) examined the excretion of male hormones in urine. The maximum excretion of androgens was found at the age of about 30 years, with a very even decline after that age. Men of 60 excrete about the same amount as those of 17. No rapid decrease could be seen corresponding to a male climacteric.

Schmidt (10) has investigated the course of diabetes in old age. In not less than 23 per cent of the patients he found an improvement with increasing age, as shown by a decrease in fasting blood sugar and a considerably decreased insulin requirement. He (11) has also investigated the calcification of the left annulus fibrosus in the heart.

Thorberg (14) and Hansen (6) have studied conduction disturbances in the arteriosclerotic heart. Schmidt (12) found that about half of the patients with arteriosclerosis were relieved of their subjective complaints by the administration of potassium iodide in doses of 15 to 30 cg. per day. No improvement in the objective symptoms could be seen.

Sobye (13), in a monograph written in English, investigated the effects of heredity in 200 cases of essential hypertension and nephrosclerosis, and showed that it plays a part in the onset of these diseases.

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10. *Ageing and Excitability,* BOURLIÈRE, F. Department of Physiology, Paris University.

The variations with age of the neuro-muscular and vestibular chronaxie were studied in man and rats, from birth to old age. Fifty rats, 1 to 810 days old, and 160 women up to 84 years, were studied.

At birth every muscle and nerve has a much lower excitability than during maturity, and the muscles with the shortest chronaxies at maturity are those which have longest chronaxies at birth, and vice versa. The sharp decline observed during the beginning of the post embryonic life seems to be influenced in rats by litter-size.

The values of the chronaxies characteristic of the adult are reached between the tenth and the twentieth days in the rat, and between the seventh and sixteenth month in man. They remain at a constant level for the rest of the life span, provided that no pathologic conditions of the nervous system are present.

This remarkable constancy of the neuro-muscular and vestibular excitability from maturity to old age does not imply that significant differences do not exist in other nervous mechanisms during senility. It simply provides another instance of the asynchronism of functional involution.

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11. *The Teaching of Geriatrics in Valencia University and the Establishment of the Spanish Gerontological Society.* BELTRAN BAGUENA, M. Department of Medicine and Geriatrics, Valencia University.

Actually the organised study of gerontology in Spain was started about two years ago. Before this date gerontologic research was limited to a few isolated investigations. Although Professor Beltrán Báguena had read occasional lectures on gerontology since 1935, a systematic course of gerontology has been given by him since 1946 when he was appointed as Professor of Geriatrics in Valencia University. In this course he was assisted by specialists in other branches of medicine. The lectures were published in three volumes (1).

After the end of the civil war a High Council for Scientific Research was established by the government and an annual grant of 35,000 pesetas has been given since 1946 by the Council for the erection of a special Gerontological Institute. Until then research on aging had been carried out in the Department of Medicine. The National Board of Health gave 100,000 pesetas for this purpose in 1948.

The gerontologic research, performed so far by Dr. Beltrán Báguena and his co-workers, can be briefly summarised as follows:

In most investigations performed by previous research workers on human material, the patients used for gerontologic research were unsuitable because of the complication of various diseases which have no connection with or are not necessarily present in pure senility. Therefore great care was taken to use for research old people free of any complicating diseases.

In these patients it was found that, contrary to the observations of some authors, there is no acceleration in blood sedimentation rate. Estimations of cholesterol and ions of potassium and calcium were also performed and found to be normal. The hyperglobulia with microcytosis, typical of old age according to several authors, was not present.

At the request of the British Society for Research on Ageing, a Spanish Gerontological Society has been established and its first inauguration meeting was held on May 17, 1948. The organisation of the Society was carried out by Professor Beltrán Báguena, on request and on behalf of the Spanish medical and scientific research workers, in particular Professor Marañon, who was one of the first in Spain to become interested in gerontology. At this meeting three items for special study were selected: senile lesions of the verte-

bral column, senile tuberculosis, and metabolism of carbohydrates in old people.

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After each of the above-mentioned addresses to the Conference, the details, relating to the subject in question, were discussed by the members of the Conference, Dr. H. Bab, Dr. F. Bourlière, Dr. F. A. E. Crew, Dr. E. C. Dodds, Dr. E. Geiringer, Dr. V. Korenchevsky, Dr. L. S. Simpson, Dr. Wilder Smith, and Dr. J. Welford.

Symposium On Physiologic Functions in the Adult

At the request of the membership of the American Physiological Society, a Symposium on Physiological Functions and Age in the Adult was organized for the Fall meeting of the Society held in Minneapolis September 15 to 18, 1948. Brief summaries of the current status of our knowledge of age changes were presented by invited speakers.

The following topics were included in the Symposium: Age Changes in Cellular Metabolism, by Dr. Albert Lansing; Age Changes in Physiological Resistance to Diseases, by Dr. Henry Simms; Physiological Aspects of Degenerative Diseases, by Dr. J. Murray Steele; Physiological Homeostasis in Aging Man, by Dr. Nathan W. Shock. Comments on experimental work in progress in the field of aging were made by Dr. Ancel Keys, Dr. K. E. King, Dr. Ernst Gellhorn, and Dr. Dale B. Harris.

General and specific questions in the field of gerontology were discussed by the members of the Symposium and the audience. The discussion served to bring to focus the scarcity of precise information on the physiologic differences between young and old people. Over a hundred members of the Physiological Society and guests attended the Symposium, and it was evident that many physiologists are actively interested in problems of gerontology.

Gerontologic Activities in Spain

FRANCISCO VEGA DIAZ

The Spanish Gerontological Society, the Sociedad Española de Gerontologia, was founded recently by the efforts of Dr. M. Beltrán Báguena, Dr. F. Grande Cobian, and Dr. F. Vega Diaz, following the initiative of Dr. Korenchevsky, London.

A first meeting of the new Society was held in Madrid in the beginning of this year. It was proposed by Dr. Marañon that the presidency should be vested in Dr. Beltrán Báguena in view of his efforts in the field of geriatrics, and this motion was carried unanimously, as was the motion to appoint a provisional committee with Dr. F. Grande Cobian as Vice-president and Dr. F. Vega Diaz as Secretary.

A second meeting was held, also in Madrid, on May 17, when the Society was constituted with the adoption of by-laws and formal election of officers. The members also agreed on the three problems to be the subjects of discussion at the first national assembly to be held in Barcelona next May. These subjects are: Senile Changes in the Spine (Dr. Pañella Casas), Tuberculosis in Old Age (Dr. Navarro Gutierrez), and Carbohydrate Metabolism in Old Age (Dr. Grande Cobian).

The following fields of research were decided upon for the future work of the Gerontological Society: studies in senile clinical pathology, biology, demography, and sociology.

Since 1946 there has been a Chair of Geriatrics in Spain, founded by the Higher Council for Scientific Research in Valencia University and held by Dr. M. Beltrán Báguena, Professor of Medical Pathology there. As far as we know this was the first chair of the kind to be set up anywhere. In 1947 the Chair received its first state subsidy and was included in a Geriatric-Studies Center with Dr. Beltrán Báguena as director. Dr. Beltrán Báguena, who has taken an active interest in geriatric problems since 1936, has published his Lessons in Geriatrics in book form (Lecciones de Geriatria), the third volume of which has recently been published.

Under the impetus given by Dr. Beltrán Báguena the following developments have taken place: A Department of Geriatrics—the first of its kind in Spain—was opened in the Barcelona Municipal Hospital of Nuestra Señora de la Esperanza, with Dr. Pañella Casas as chief physician. The Hospital is an admirable institution, well built, equipped, and staffed. It includes among its staff the Director, Dr. Vanrell, and the cardiologist, Dr. Martinez Gonzalez. The Department gave the first course in geriatrics outside a university during April and May this year with the following program, the papers of which will soon be published:

Dr. M. Beltrán Báguena: Vascular Arteriosclerogenesis.
Physiopathology of Vascular Arteriosclerotic Degeneration.

Dr. Vanrell Cruells (Director of the Hospital): Gynecologic Affections of Senility.

Dr. Mas Oliver (Head of the Hospital's Department of Surgery): The Surgery of the Aged.

Dr. Martinez Gonzalez (Head of the Department of Cardiology): Disturbances of the Cardiac Rhythm in Senility.

Drs. Pañella Casas, Bacardi Nogueras, and Monteys Porta (Head and members of the Department of Geriatrics): The Problems of Geriatrics.

Dr. Lucena Raurich (Dean of the Barcelona Municipal Medical Department): Disorders of Micturition in Old Age.

Dr. F. Vega Diaz (Head of the Department of Geriatrics, General Hospital, Madrid): The Functional Capacity of the Aged from the Cardiovascular Standpoint. Its Practical Determination and Importance.

Another Department of Geriatrics was opened subsequently by Dr. G. Marañon, Professor of Endocrinology in the Institute

of Medical Pathology at the Madrid General Hospital. The Director is Dr. F. Vega Diaz. The Department, which will conduct investigations in cardiology and endocrinology, will be officially opened in November this year when a Geriatrics Week will be held, with lectures by Spanish medical authorities, and it is hoped that scientists from other countries will also attend.

The work done in this field in Spain will be reported on in a Journal of Geriatrics which will be published in Valencia. The editor of the supplement will be Dr. Beltrán Báguena.

The Spanish Gerontological Society intends to invite foreign specialists periodically to lecture in Spain on their gerontologic research. The National Public Health Department and the Director of the Department, Dr. Palanca, have promised financial assistance in this scheme, and the next estimates will include sums for sociologic and other research work in connection with gerontology.

Annual Meeting of the Division On Maturity and Old Age of the American Psychological Association

The Division on Maturity and Old Age of the American Psychological Association held its annual meeting in Boston, Massachusetts, September 6 to 11, 1948. Seven papers reporting research on aspects of aging were read. The principal topic was the problems of personal adjustment at time of retirement and later life. Research was also reported on concept regression in the elderly, age changes in visual dark adaptation, and manifestations of aging in identical twins.

In addition, three symposia were organized. The first symposium, under the chairmanship of Dr. O. J. Kaplan, discussed Current Research Programs in the Psychology of Aging. Outlined briefly and discussed were the programs of the Gerontology Section of the U. S. Public Health Service, the longitudinal studies on social adjustment of the University of Chicago, and the program of the projected Moosehaven Laboratory for Research on Aging.

Two symposia were held in conjunction with the Conference on Aging of the American Academy of Arts and Sciences. Dr. Ross McFarland organized the first of these on the topic, Psychophysiological Changes with Age. The second symposium was on the topic, Problems of Adjustment in Old Age, under the Chairmanship of Dr. William Malamud.

New officers for the Division are as follows: Herbert Conrad, President; George Lawton, President-Elect; Raymond G. Kuhlen, Secretary-Treasurer.

Abstracts of papers to be presented at the First Annual Scientific Meeting of the Gerontological Society, Inc. in New York, January 8 and 9, 1949, arrived too late to be included in this issue but appear as a special supplement.

PULSE-WAVE VELOCITY AS AN INDEX OF AGING IN THE CARDIOVASCULAR SYSTEM

The diagnosis and evaluation of arteriosclerosis is difficult at best. Only a few peripheral arteries are accessible to inspection and palpation, others may reveal evidence of calcification by radiologic examination, and the retinal arterioles may be seen with the ophthalmoscope. The status of other arteries can be inferred only from the clinical findings in organs such as the heart, kidney, and brain, and the poor correlation between arteriosclerosis in these organs and in peripheral arteries is well known. Since the measurement of pulse-wave velocity is relatively simple, it would be convenient if arteriosclerosis or senile changes of the measured arteries or even of other arteries throughout the body could be predicted from such a determination.

The pulse-wave velocity is equal to the length of artery traversed by the pulse-wave front divided by the time required to do so. The usual method of measurement is to use two pickup devices at points on the same or different accessible arteries such as the carotid, radial, femoral, or dorsalis pedis. If the recording points are on different arteries, the effective distance travelled is the difference between the lengths of the two arteries from a common central point. It is difficult to measure externally from landmark to landmark the lengths of arteries within the body; to date tortuosity has not been taken into account.

Fundamentally it is the arterial extensibility or its reciprocal, arterial rigidity, which determines pulse-wave velocity. The three factors which contribute to extensibility, namely the modulus of elasticity of the arterial wall, the thickness of the arterial wall, and the radius of the artery, may vary independently and in opposite directions and unfortunately there is no means for estimating each separately. In addition, the periarterial tissue exerts an unmeasured influence on extensibility.

Moens (Die Pulskurve, E. J. Brill, Leiden, 1878) derived experimentally the classical formula for predicting arterial pulse-wave velocity from the physical characteristics of a fluid-filled tube:

$$V = K\sqrt{\frac{Ec}{2\rho y}}$$

where

- V = velocity in meters per second
- K = a constant
- E = Young's modulus of elasticity in dynes/cm^2 x 10^6
- c = thickness of arterial wall in millimeters
- ρ = density of blood
- y = diastolic radius of artery in millimeters

It can be seen from the above formula that increases in Young's modulus (E) or in the thickness of the arterial wall (c) tend to in-

crease pulse-wave velocity (When Young's modulus is large, a substance is resistant to stretch). Higher blood density (ρ) or larger diastolic radius (y) will decrease pulse-wave velocity.

A constant is usually assumed for blood density; other small errors of assumption are that the blood is homogeneous and of negligible viscosity and that the pulse-wave is small.

In actuality, the extensibility characteristic of large arteries happens to be nonlinear; the experimentally determined pressure-volume curve is S-shaped and in the opinion of King (Journal of Applied Physics, *18:* 595–600, 1947) resembles that of a class of substances called elastomers of which rubber is an example. He therefore considers an artery as a cylindrical elastomeric tube and has derived a rather complicated equation for the prediction of pulse-wave velocity which includes parameters dependent on age and blood-pressure. Values of pulse-wave velocity calculated from this formula agree well with experimental observations on arteries made by other investigators.

At high values of blood-pressure arteries become less extensible so that pulse-wave velocity is disproportionately increased. This accounts for the marked increase in pulse-wave velocity in the presence of hypertension and demonstrates that blood-pressure is perhaps the most important variable for which compensation must be made. Bramwell, MacDowall, and MacSwiney (Proceedings of the Royal Society, London, s. B., *94:* 450–454, 1923) introduced an ingenious means of applying either positive or negative pressure to the arm and were thereby able to control the effective internal pressure of the brachioradial artery. This principle may be used to refer pulse-wave velocity to a constant blood-pressure level. As noted previously, King's equation attempts to incorporate the blood-pressure factor.

Remington, Hamilton, and Dow (American Journal of Physiology, *144:* 536–545, 1946) rather than thinking of a homogeneous elastomer explain that the non-linear extensibility of artery is because of the presence of three types of tissue, smooth muscle, elastic tissue, and collagenous tissue. Each of these essentially obeys Hooke's law that strain is proportional to stress whereas the arterial wall as a whole does not. The limiting factor in extensibility is the collagenous tissue.

Certain physiologic changes influence pulse-wave velocity. Vasomotor control of smooth muscle tonus is certainly important in medium-sized and small arteries. This, in turn, is affected by the emotional state, temperature of the environment, and the like. Although only about one-tenth of the pulse-wave velocity, the linear velocity of blood flow may also vary. The effect of all these factors must, however, be slight since Steele (American Heart Journal, *14:* 452–465, 1937) has demonstrated that the pulse-wave velocity is highly reproducible in successive tests on the same individual.

Most clinical studies of pulse-wave velocity have been concerned with arteriosclerosis but the results are variable. Sands (American Journal of Physiology, *71:* 519–533, 1925) for instance, found no consistent changes in velocity in arteriosclerosis. Hallock (American Journal of the Medical Sciences, *192:* 371–377, 1936) on the other hand found a significant increase in the radial pulse-wave velocity of young treated diabetics whose mean age was 16 years. This is the only study with good documentation in which increased pulse-wave velocity is demonstrated within a given age group in the absence of hypertension; it is probable that the patients studied had no stigmata of arteriosclerosis. There is no evidence available that diabetics with frank arteriosclerosis have a pulse-wave velocity greater than normal.

Hallock (Archives of Internal Medicine, *54:* 770–798, 1934) has studied the largest number of normal subjects to date and was able to demonstrate a progressive increase in velocity with age which was, for the most part, significant from decade to decade. For example, at age 22 he found pulse-wave velocity in the radial artery to be 6.3 m./sec., increasing to 9.6 m./sec., at age 65. He found an increased range of values above age 40 for the aorta and above age 50 for the radial ar-

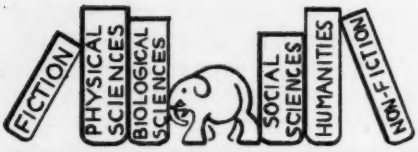
tery. Steele also demonstrated the increase with age. King, as before mentioned, includes an age-dependent parameter in his formulations.

Beyerholm (Acta medica Scandinavica, *67:* 323–352, 1927) reported an increase in velocity with age but found no difference between subjects with clinically detectable arteriosclerosis and those without. Haynes, Ellis, and Weiss (American Heart Journal, 11: 385–401, 1936) confirmed this and expressed the opinion that no information of value in an individual case could be obtained by this method.

In the past a number of other reports have appeared which are confused and difficult to interpret but which often conclude an increased pulse-wave velocity in arteriosclerosis. The general feeling has been that this is true. Indeed one gains the impression from the inspection of Moens' formula that changes in Young's modulus and in arterial wall thickness should over-balance any effect of increased radius and result in greater pulse-wave velocity. But in the face of work, such as that of Beyerholm and of Haynes, Ellis, and Weiss, it now seems reasonable to believe that the reported increases were attributable to age changes and not to arteriosclerosis since in some of these studies an older group with arteriosclerosis was compared with a younger group of normal subjects. Furthermore, the number of subjects studied was usually small. Thus one must conclude that pulse-wave velocity is not a useful measure of arteriosclerosis in individuals or in groups of individuals.

On the other hand there is no doubt that the technique of pulse-wave velocity measurements can be used as a research tool in the study of arterial age-changes. Since the deviation of values about the mean is great, even at the age of 20, age-changes in a given subject cannot be assessed at any one time even though the measurement itself is highly reproducible. It may be true that different rates of aging account for the variation between individuals even in youth but it seems more likely to be a reflection of inherent morphologic differences. For this reason, the method may only be used in long-time studies of given individuals, each serving as his own control, or it may be used in short-time studies comparing groups of subjects.

ROBERT M. PAINE
U. S. Public Health Service
Baltimore City Hospitals
Baltimore, Maryland



BOOKS

GERIATRICS IN SPAIN

LECCIONES DE GERIATRIA: ENFERMEDADES DE LA VEJEZ, M. Beltrán Báguena, Librería de F. Garciá Muñoz, Valencia, Spain, 1947, price vol. I, 28 pesetas, vol. II, 35 pesetas, 267 pages, paper bound.

This book, published in two volumes, presents the author's opinions on the infirmities of old age. The first volume of 131 pages discusses the problem of senility as reflected in various organ systems from observations in the literature. A great deal of emphasis is placed on age changes in the respiratory system and the development of emphysema in the aged. A final chapter in this volume is devoted to a discussion of the incidence of pneumonia in the aged, largely on the basis of data obtained prior to the use of the sulfa drugs and penicillin.

The second volume of 134 pages opens with a chapter on the clinical aspects of pulmonary tumors. One chapter presents morbidity and mortality statistics for pulmonary tuberculosis in the province of Valencia from 1933 to 1946. The age categories used are not uniform so that the data on the various clinical categories cannot be evaluated in terms of age changes. The two final chapters are devoted to the clinical aspects of degenerative and senile changes in the cardiovascular system.

Although numerous investigators are mentioned by name, no bibliographic references are given. The title of these volumes is misleading since most emphasis is placed on the respiratory system. The cardiovascular system is treated only superficially; and other areas of importance in geriatrics, such as the gastro-intestinal tract, the genito-urinary tract, bones and joints, the nervous system, the blood and neoplasms (other than the lung), are only mentioned or omitted entirely. It is possible that the author will treat these important topics in later volumes of the series.

N. W. Shock

A BRITISH REPORT ON SOCIAL MEDICINE

THE SOCIAL MEDICINE OF OLD AGE —Report of an inquiry in Wolverhampton, J. H. Sheldon, M.D., F.R.C.P., published for the trustees of the Nuffield Foundation, G. Cumberlege, Oxford University Press, London, 1948, price, 5s., 239 pages, paper bound.

The report of a Survey Committee on the Problems of Ageing and the Care of Old, appointed by the trustees of the Nuffield Foundation, appeared in January, 1947, under the title, "Old People." In addition to the illuminating studies of the living conditions of random samples of old people in some typical urban and rural areas of Great Britain, this volume includes a short note by the Medical Sub-Committee on the Causes and Results of Ageing, devoted largely to formulating recommendations for the organization of Research on aging. One of the members of this sub-committee, Dr. J. H. Sheldon, Director of Medicine, The Royal

Hospital, Wolverhampton, has now published a medical survey of a sample of old people in Wolverhampton to complement the social inquiry made on the same group by lay investigators.

To this assignment, carried out in his spare time, Dr. Sheldon brought unusual professional gifts together with warm sympathy for the old and a remarkably preserved objectivity. In the preface he points out that by design this is a scientific work without references to other scientific writings. However valuable the knowledge of the work of others may be in experimental studies, this is "not necessarily true of observation, where too much knowledge may, in fact, be a handicap, for under its pressure the mind finds it only too easy to confine its vision to those things it has been previously conditioned to look for." Not a little of the pleasure to be derived from reading the book stems from the author's fresh approach, his total lack of medical pedantry and his strict adherence to his own findings in general discussions.

Considerable emphasis is laid upon the use of the random sample as a new experience for a physician. "The actual practice of medicine is virtually confined to those members of the population who either are ill, or think they are ill, or are thought of by somebody else to be ill, and these so amply fill up the working day that in the course of time one comes unconsciously to believe that they are typical of the whole . . . The use of a random sample brings to light those individuals who are ill and know they are ill but have no intention of doing anything about it, as well as those who never have been ill and probably never will be until their final illness . . . Somewhat less than one-third of the sample (29 per cent) were receiving medical attention at the time of the survey, somewhat more than one-third (44.2 per cent) had required attention in the previous 3 years but were not then needing it, while the remainder (26.8 per cent) not only had gone for more than 3 years without seeking medical aid, but in many cases had virtually never required it."

Of great interest is the technique employed in the inquiry—the use of a questionnaire filled out by the investigator, in every case Dr. Sheldon himself, at the patient's home. The questions were drawn up after considerable study and were doubled in number after a trial on the first 50 cases. No physical examinations were made, but the old person was closely observed throughout the whole interview. In many cases the information obtained in this way was augmented by the generous cooperation of the medical practitioners of Wolverhampton who supplied needed facts regarding their patients. The medical survey which occupied a period of twenty-one months succeeded in obtaining a total of 477 completed forms, the analysis of which forms the basis of this report.

The inquiry concerned itself with the physical and mental state of old people living at home, with the domestic structure, and with the management of illness in the home. Of great significance is the emphasis laid upon the strains created by illness on old people and also upon those who care for them. "It was found in Wolverhampton that 7.7 per cent of the old people were causing great strain on the younger generation, using these words to imply a mode of existence which deprived the individual of a normal life and turned her into a drudge . . . These members of the younger generation are clearly carrying a grossly unfair burden, and any scheme for the betterment of the aged that failed to include a consideration of their needs would be lacking in equity."

In his concluding chapter, "Random Reflections," Dr. Sheldon discusses what is normal for old age, the possible lines of further inquiry, and the important contribution that can be made by the general practitioner. He points to the incredible determination of old people to live in spite of serious physical defects, and stresses that occupation is the best medicine, bringing out how much more fortunate are the women in this respect. The value of specific remediable measures is discussed with regard to dentures, spectacles, hearing-aids, physiotherapy, and chiropody.

The reviewer hopes that the direct quotations have indicated the vigor and freshness of the author's style. This remarkable con-

tribution to the literature of old age should be read by physicians and social workers with pleasure and can be counted on to stimulate others to follow Dr. Sheldon's example in approaching these ancient problems with understanding and sympathy, without prejudice. The whole work, as its title indicates, is a splendid example of the integration of medical and social welfare viewpoints that today characterizes the best in the efforts of our British colleagues.

FREDERIC D. ZEMAN

SERVICES FOR THE AGED IN CHICAGO

COMMUNITY PROJECT FOR THE AGED: REPORT ON THE FIRST YEAR'S PROGRAM, MARCH, 1947–FEBRUARY, 1948, Elizabeth Breckenridge, Council of Social Agencies of Chicago, 1948, 44 pages, mimeographed.

One of the most interesting of the current efforts to focus attention and to develop services to meet the current and potential problems of the aged is the Community Project for the Aged of the Council of Social Agencies of Chicago. The mimeographed document under review is a report on the first year's program of this agency and shows what can be done by planned, concentrated, and cooperative efforts in one of our great metropolitan communities. While the project is being sponsored by a social agency, there is obvious cooperation and interest in the entire community, both lay and professional.

This annual report has an extensive introduction which includes statistical material on the composition of the population nationally and in the Chicago area, both by age groups and by other social characteristics. A second section of the report deals with services for the aged in the Chicago area, and gives important information collected through the inventory of facilities which was one of the activities of the project during the first year. The report shows that approximately 100,000 of the some 400,000 people 60 years and over in the Chicago area are being served in one way or another by the social agencies. It is significant to note, however, that over 85 per cent are receiving either old age assistance or old age and survivor's insurance.

The main part of the report, Committee and Staff Activity During the First Year, indicates that an excellent start has been made in setting up research projects and in getting the program started. A volunteer service or friendly visiting program for the aged has been organized and various recreation projects have been attempted. A number of informal studies were made during the year and plans perfected for some basic research on the needs, interests, and characteristics of the aged group in this community.

Another section deals with Needs As We See Them Today. Among the six items enumerated the first three deal with financial security or economic support. According to the report itself, the "most pressing is the need for financial security." The other items include Supplementary Personal Services, such as guidance, case work and psychiatric service, Health and Medical Care, and Significant Occupational Activities. The agency hopes to promote employment opportunities during the coming year and to do intensive work on the development of programs with homes for the aged.

The report is well worth reading. The whole effort of this project will be watched carefully by many other communities who have not yet stirred themselves to some of the changing needs. As a minor point, this reviewer hopes that the word "pension" will not be confused with "insurance" or "assistance" in future reports. An old age pension is neither old age insurance nor old age assistance. These three terms are confused in this report. As a whole, however, the report is well done and serves its purpose of telling the story of the activities and planning during the first year of operation of the Community Project for the Aged in Chicago.

BENJAMIN E. YOUNGDAHL

PLANNING FOR RESEARCH IN SOCIAL ADJUSTMENT

SOCIAL ADJUSTMENT IN OLD AGE: A RESEARCH PLANNING REPORT, Otto Pollak, Bulletin 59, Social Science Research Council, New York, 1948, $1.75, 199 pages, paper bound.

This timely and valuable bulletin by Dr. Otto Pollak, prepared with the able assistance of Dr. Glen Heathers, is a "must" on the reading list of any person seriously interested in, or engaged in, work with or for older people—whether that work be in individualized or more general aspects of professional activity. This includes members of the medical profession as well, although Dr. Pollak indicates the bulletin is a report to propose, outline, and assist planning for research on social adjustment to old age, with the specific omission of medical research. The report achieves its objective with clarity, conciseness, and amazing completeness. To limit the contribution made to gerontology to the delineation of areas for research, however, is to do the report a major injustice, since within its small compass it is compact with facts and knowledge of the subject which constitute an important addition to the equipment of any and all persons working with human beings of any age. Beyond this it is fertile with ideas which lend themselves, through research methods, to exploration of the many facets of adjustment to old age.

Dr. Pollak's sympathetic understanding of the individual and of aging has given his discussion of the psychologic analysis of problems of adjustment to aging peculiar significance for workers with individuals in particular. Satisfactory social adjustment in old age is not solely dependent upon the elderly individual but is also determined by societal attitudes of other age groups toward the individual. The correlation of this with proposals for the analysis of adjustments of the aging individual's needs, capacities and predispositions in relation to opportunities provided for him in the family, for making a living, for retirement, recreation, education, politics and religion, carries the same special significance for all persons interested in the aged—both as members of a professional group and as persons who themselves will at some later date have personal adjustments to make.

The report includes a helpful statement on sampling methods for research, by Frederick F. Stephan, and an excellent selective bibliography.

OLLIE A. RANDALL

CHANGES IN THE EYES

THE EYE MANIFESTATIONS OF INTERNAL DISEASE, second edition, I. S. Tassman, C. V. Mosby Co., St. Louis, 1946. 614 pages.

This book, while of interest to the ophthalmologist, places primary emphasis on the eye manifestations of internal disease. The first five chapters provide a description of the structure of the normal eye, a general description of the causes of changes in the eye, and a brief description of the examination of the patient and some of the routine tests, methods, and apparatus employed in examinations of the eye. These chapters are clearly written and amply illustrated and are most useful to those investigators interested in the study of the eye who are not experienced ophthalmologists. This part of the book would be strengthened by including a statement of the reliability of measurement of the various tests and a discussion of the potential sources of error.

The second part of the book presents the essential description of the eye manifestations of a different disease in each chapter. The chapter on diseases of the cardiovascular system will be of particular value to those interested in problems of aging. The descriptions of the eye changes are clearly written and well illustrated. The book is attractively printed on glossy paper with well executed color plates.

N. W. SHOCK

BOOKS RECEIVED

Books received since June 1, 1948, are acknowledged in the following list. Insofar as space and time permit, some will be selected for review in a later issue, but it is unlikely that all will be reviewed.

Aging, Family Health Series, Guide for Public Health Nurses, No. 8, Community Service Society, Department of Educational Nursing, New York 10, New York, 1948, 15c per copy, 12c each for 100 or more, 23 pages (pamphlet).

Cancer Manual, The Cancer Committee of the Iowa State Medical Society, Athens Press, Iowa City, 1948, $1.00, 160 pages, paper bound.

Community Project for the Aged: Report on the First Year's Program, March, 1947–February, 1948, by Elizabeth Breckenridge, Council of Social Agencies of Chicago, 1948, 44 pages, mimeographed (reviewed in this issue, page 308).

Mathematical Methods for Population Genetics, by Gunnar Dahlberg, Interscience Publishers, New York, 1948, approximately $4.50, 182 pages, 63 figures and tables.

Occupational Marks, by F. Ronchese, Grune & Stratton, Inc., New York, 1948, $5.50, 181 pages.

Second Interim Report Concerning Care of the Chronically Ill in Illinois, The Commission on the Care of Chronically Ill Persons, 1947, 279 pages, paper bound.

Social Adjustment in Old Age: A Research Planning Report, by Otto Pollak, Bulletin 59, Social Science Research Council, New York, 1948, $1.75, 199 pages, paper bound (reviewed in this issue, page 309).

Social Medicine of Old Age: Report of an Inquiry in Wolverhampton, by J. H. Sheldon, M.D., F.R.C.P., published for the trustees of the Nuffield Foundation, G. Cumberlege, Oxford University Press, London, 1948, price 5 s., 239 pages, paper bound (reviewed in this issue, page 306).

Therapeutic Notes, 55: No. 7–8, special geriatrics issue, Parke, Davis & Co., 1948, 29 pages (pamphlet).

INDEX TO CURRENT PERIODICAL LITERATURE

It is difficult to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or send reprints.—Editor.

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First Annual Scientific Meeting
of the
Gerontological Society

Hotel Commodore, New York City
January 8 and 9, 1949

Saturday, January 8, 1949

8:30- 9:00 a.m. Registration.

Biochemistry and Physiology of the Aging Process. Albert I. Lansing, Chairman, Washington University School of Medicine, St. Louis.

9:00- 9:15 a.m. Senile Changes in the Salivary Glands. Warren Andrew, Washington University School of Medicine, St. Louis.

9:15- 9:30 a.m. The Effect of Hyperventilation on the Electroencephalogram in Relation to Age. T. C. Barnes, Hahnemann Medical College and Hospital of Philadelphia, Philadelphia.

9:30- 9:45 a.m. Blood Volume Studies in Middle Aged and Elderly Males. Jerome E. Cohn and Nathan W. Shock, Section on Cardiovascular Diseases and Gerontology, U. S. Public Health Service and Baltimore City Hospitals, Baltimore.

9:45-10:00 a.m. Skin Lipid Secretion in Middle-aged and Old Individuals. Esben Kirk, Washington University School of Medicine, St. Louis.

10:00-10:15 a.m. Intermission.

10:15-10:30 a.m. The Direct Effect of Steroids on the Senile Human Skin. Joseph W. Goldzieher, New York City.

10:30-10:45 a.m. The Influence of Parental Age on Longevity in Rotifers. A. I. Lansing, Washington University School of Medicine, St. Louis.

10:45-11:00 a.m. A Comparison of the Histochemical Changes with Age in the Elastic Tissue of the Aorta, Coronary, Hepatic and Renal Arteries. H. T. Blumenthal, A. I. Lansing and S. H. Gray, Jewish Hospital and Washington University School of Medicine, St. Louis.

11:00-11:45 a.m. A Relationship of Maleness to Shortness of the Lifespan and to Certain Pathological Conditions. James B. Hamilton, Long Island College of Medicine, Brooklyn, New York.

12:30 Meeting of Council of Gerontological Society.

1:30- 4:30 p.m. Symposium

"Scientific Approaches to Problems of Aging" Chairman—Nathan W. Shock, Chief, Section on Cardiovascular Diseases and Gerontology, National Heart Institute, U.S.P.H.S. and Baltimore City Hospitals, Baltimore.

The Biological Approach. Fernandus Payne, Indiana University, Bloomington.

The Physiological Approach. Anton J. Carlson, University of Chicago, Chicago.

The Social Science Approach. Ernest W. Burgess and Robert J. Havighurst, University of Chicago, Chicago.

The Medical Approach. Robert A. Moore, Washington University School of Medicine, St. Louis.

Discussion by members and guests.

6:30 Dinner Meeting (Hotel Commodore). Toastmaster —Edward J. Stieglitz, Washington, D. C.

Presidential Address—Joseph Aub, Harvard University.

Informal remarks by—C. J. Van Slyke, Director, National Heart Institute, NIH, USPHS, Bethesda, Md.

William deB. MacNider, University of North Carolina, Chapel Hill.

Alfred Cohn, Rockefeller Institute for Medical Research, New York.

Edward R. Bortz, Past President, Amc. Medical Association, 1947-48, Philadelphia.

E. V. Cowdry, Washington University School of Medicine, St. Louis.

Clive McCay, Cornell Univ., Ithaca, N. Y.

Sunday, January 9, 1949

Psychological and Sociological Aspects of Aging. S. L. Pressey, Chairman, Ohio State University, Columbus.

9:00- 9:15 a.m. The Shock of Aging. Martin Gumpert, N. Y. C.

9:15- 9:30 a.m. The Chinese Attitude Toward Old Age. Albert R. Chandler, Ohio State University, Columbus.

9:30- 9:45 a.m. Counselling the Older Person. George Lawton, New York, New York.

9:45-10:00 a.m. Some Factors Affecting Vocabulary Size in Later Maturity: Age, Education, and Length of Institutionalization. Charlotte Fox and James E. Birren, Section on Cardiovascular Diseases and Gerontology, National Heart Institute, NIH, Bethesda, Md. and the Baltimore City Hospitals, Baltimore.

10:00-10:15 a.m. Statistical Problems in "Cross - Sectional" Age Data. Bronson Price, U. S. Children's Bureau, Washington, D. C.

10:15-10:30 a.m. Intermission.

10:30-10:45 a.m. Character Sketch Comparisons of "Successful" and "Problem" Old People. Elizabeth M. Simcoe and S. L. Pressey, Ohio State University, Columbus.

10:45-11:00 a.m. Psychological Implications of Aging in Airline Pilots. Ross A. McFarland, Harvard School of Public Health, Boston.

11:00-11:15 a.m. Visual Acuity as a Function of Age and Retinal and Macular Degeneration. James E. Birren and Malcolm W. Bick, Section on Cardiovascular Diseases and Gerontology, NIH, PHS, Bethesda, Md. and the Baltimore City Hospitals, Baltimore, Md.

11:15-11:30 a.m. Supportive Therapy in Geriatric Casework. Ruth Laverty, Peabody Home for Aged Women, New York, New York.

11:30-12:00 Old People in Industry. T. North Whitehead, Harvard University, Cambridge.

12:00 Luncheon Meeting. Business Meeting of the Gerontological Society. President—Joseph Aub. President-elect—Clive McCay.

2:00- 5:00 p.m. The Physician and the Aged Patient. F. D. Zeman, Chairman, Home for the Aged and Infirm Hebrews, New York, New York.

2:00- 2:20 p.m. Basal Metabolism in Old Age. William B. Kountz, Washington University School of Medicine, St. Louis.

2:20- 2:40 p.m. Gastroenterologic Diseases in the Advanced Decades of Life. Burrill B. Crohn, Mount Sinai Hospital, New York.

2:40- 3:00 p.m. Distinctive Features of Coronary Disease in the Aged. Ernst P. Boas, Mt. Sinai Hospital, New York.

3:00- 3:20 p.m. Recent Developments in Vascular Occlusions of the Extremities. Frederic W. Bancroft, New York Medical College, New York.

3:20- 3:40 p.m. Favorable Mental Disorders in the Elderly. Robert Bush McGraw, Neurological Institute, New York.

Discussion

The Technique of Nutritional Therapy. Morton S. Biskind and Gerson R. Biskind, New York City San Francisco. (read by title).

Program Committee

Albert I. Lansing
S. L. Pressey
Ernst W. Burgess
Edward J. Stieglitz
Nathan W. Shock, Chairman

Committee on Local Arrangements

Frederic Zeman
J. Murray Steele
Henry Simms
Ollie A. Randall, Chairman

ABSTRACTS of PAPERS

BIOCHEMISTRY and PHYSIOLOGY

SENILE CHANGES IN THE SALIVARY GLANDS. WARREN ANDREW. *Dept. of Anatomy, Washington University School of Medicine, St. Louis.*

Parotid glands from 100 Wistar Institute rats have been sectioned and studied. Old age brings about a considerable degree of fatty degeneration in this gland, with the destruction of large areas of parenchyma.

Aberrant epithelial cells are found in relatively intact, surviving parenchyma. They are almost, if not entirely, constant occurrences in senile rats. They are characterized by (1) an increase in size of cell body, often accompanied by hypertrophy of the nucleus (2) an increased nucleolar-nuclear ratio (3) a tendency to internal division of the nucleus and (4) unmistakable instances of amitotic division leading apparently to formation of small nests of such cells.

The cytoplasm is generally light staining. The nucleus may be large and vesicular, or small, shrunken, and pycnotic.

The cells of aberrant type in the parotid gland can be said to show certain interesting resemblances to tumor cells in that they occur singly or in small groups as elements very different from the neighboring cells and in that they show a definite, although low-grade tendency to proliferation, and that certain nuclear changes, as the increased size of the nucleoli and a tendency to vesicle formation within the nucleus have been described as characteristics of many malignant cells.

The very deeply staining ergastoplasm in the vicinity of the nucleus may be related to the hypertrophy of the ribonuclease-producing nucleolus.

Initial studies on the submandibular glands of Wistar Institute rats have been made, and the results indicate that in contrast to the parotid, practically no fatty degeneration occurs here in old age. The presence of aberrant epithelial cells, however, is as conspicuous in the submandibular as in the parotid gland.

THE EFFECT OF HYPERVENTILATION ON THE ELECTROENCEPHALOGRAM IN RELATION TO AGE. T. C. BARNES. *Hahnemann Medical College and Hospital of Philadelphia, Philadelphia, Pennsylvania.*

The EEG's of aged persons show no abnormalities due to age *per se*. The most striking feature of the electroencephalogram of old people is the persistance of normal waves during deep breathing which usually produces abnormally slow waves in younger persons. The writer has devised a method of scoring the EEG in hyperventilation which gives corrections for physiological factors that may influence the EEG indirectly. The method of scoring is as follows: Normal EEG in hyperventilation plus 2; abnormal waves minus 3 to minus 15 depending on severity; high blood sugar minus 4; rapid pulse plus 4; large vital capacity plus 2; cold hands plus 3. Corrections for decreasing susceptibility with age range from plus 3 (under 19) to minus 6 (over 55). The scores for degree of abnormality of age groups were: 20 to 24, epileptics, 22 cases, minus 8.2; non-epileptics, 10 cases, minus 2.3; 25 to 29, epileptics, 12 cases, minus 7.2; non-epileptics, 11 cases, minus 3.2; 30 to 34, epileptics, 11 cases, minus 7.4; non-epilptics, 4 cases, minus 5.5; 35 to 39, epileptics, 8 cases, minus 6.1; non-epileptics,

40 to 44, epileptics, 2 cases, minus 4.5; non-epileptics, 9 cases, minus 0.40; 12 cases, minus 0.83; 45 to 49, epileptics, 11 cases, minus 4.8; non-epileptics, 5 cases, minus 0.40; 50 to 54, epileptics, 2 cases, minus 0.50; non-epileptics, 6 cases, plus 0.83; above 55 epileptics, 6 cases minus 1.6; non-epileptics, 7 cases, minus 0.71. The stability of of the acetylcholine metabolism of the brain probably increases with age.

BLOOD VOLUME STUDIES IN MIDDLE AGED AND ELDERLY MALES. Jerome E. Cohen and Nathan W. Shock. *Section on Cardiovascular Diseases and Gerontology, National Institute of Health and the Baltimore City Hospitals, Baltimore, Maryland.*

Blood volume determinations utilizing Evans blue (T-1824) were made on 60 males aged 50-90 years. The subjects were selected from the population of the Infirmary Division of the Baltimore City Hospitals. All subjects were ambulatory, free from acute or chronic infections and had no recent surgery. None of the subjects showed any evidences of fluid retention such as ankle edema, constant fine moist râles at the lung bases, enlarged liver or abdominal fluid. All patients with a history of liver disease, heart failure or exertional dyspnoea were excluded. None were receiving medication of any kind.

Blood volumes were estimated under basal conditions by reading the optical density of blood serum samples drawn ten minutes following the injection of a standard amount of the dye. (T-1824)

No significant relationship between age and plasma or blood volume was observed. The mean plasma volume varied from 46.6 cc/kg body wt. at age 60-69 to 49.8 cc/kg body wt. at age 80-89 yrs. Corresponding values for total blood volume were 78.3 and 82.8 cc/kg body weight respectively.

SKIN LIPID SECRETION IN MIDDLE-AGED AND OLD INDIVIDUALS. Esben Kirk. *Division of Gerontology, Washington University School of Medicine, St. Louis.*

The total lipid and cholesterol secretion was determined in 234 individuals on a 10 sq.cm. skin area of the forehead using the method of Kvorning for the lipid sampling. 210 of the subjects were above the age of 40, the majority between the ages 60 and 85 years. The total lipid contents of the samples were determined by the gasometric method of Van Slyke, Page, and Kirk, the cholesterol by the Liebermann Burchard reaction.

The sebaceous secretion as measured in a 12-hour period was found to be approximately the same in both sexes until the age of 70. Above this age a significant sex difference was found, the mean 12 hour secretion in the women being only 1/2 (70-79 years) and 1/3 (above 80 years) of that observed in the men, in whom the secretion showed a moderate tendency to increase with old age. In agreement with this the 4 hour sebaceous secretion, indicating the secretory rate, showed great constancy from youth to old age in the men, whereas the secretion in the old women was only about 1/4 of that observed in young women.

The skin cholesterol secretion showed a similar, but less marked difference between the two sexes.

THE DIRECT EFFECT OF STEROIDS ON THE SENILE HUMAN SKIN. Joseph W. Goldzieher. *New York, New York.*

Studies were carried out on the effect of varying concentrations of natural estrogen applied directly to the skin of 31 females and five males. Skin biopsies were taken at 10 day intervals both on control and on treated surfaces: a total of 321 biopsies were carried out. The results indicate that estrogen produced no change in the normal skin

of young females when applied in doses of 5000 I. U. per ounce over a period of 30 to 60 days. Senile female skin showed regeneration of the epidermis but male skin did not in doses of 5000 I. U. per ounce. In the skins which responded to treatment the hyperplastic changes levelled off after 40 to 50 days. Higher doses of estrogen applied as a sprayed ether solution produced similar results in two males and one female, showing that the previous non-response of the male was a matter of dosage.

The effect of similar application of testosterone propionate was then studied in 5 males and 1 female. One mg. per day was applied on a 5 x 5 cm. area. Normalization of the senile epithelium identical with that observed during the experiments with estrogen was obtained, regardless of the sex of the patient.

Further studies are under way with the use of desoxycorticosterone, progesterone and pregnenolone.

THE INFLUENCE OF PARENTAL AGE ON LONGEVITY IN ROTIFERS. A. I. Lansing. *Dept. of Anatomy, Washington University School of Medicine, St. Louis.*

Previous investigations have shown that a non-genic transmissible but reversible factor is operative in determining longevity of rotifers (J. Gerontol. 2: 228, 1947) (Proc. Natl. Acad. Sci. 34: 304, 1948). Those experiments show that all adult rotifers contain the aging factor but that less than full-grown rotifers do not contain it. Old orthoclones were studied and characterized. In the present studies an attempt was made to determine if young or adolescent orthoclones could be maintained indefinitely and also to determine the maximum extension of life span obtainable in a young orthoclone. At the time of writing a young (5 day) orthoclone has been carried into the 54th generation. Longevity in this orthoclone has increased steadily from a mean of 24 days in the parental stock to approximately 40 days. Some rotifers have life spans in excess of 60 days although such extreme longevity has not been observed in any control population. The period of growth of rotifers in these young orthoclones is greatly extended. The possible significance of these experiments will be discussed.

A COMPARISON OF THE HISTOCHEMICAL CHANGES WITH AGE IN THE ELASTIC TISSUE OF THE AORTA, CORONARY, HEPATIC AND RENAL ARTERIES. H. T. Blumenthal, A. I. Lansing and S. H. Gray. *Jewish Hospital and Washington University School of Medicine, St. Louis, Mo.*

In previous reports it has been shown that there is a peculiar affinity of the elastic tissue of arteri. for calcium. The elastic tissue shows a progressively increasing content of calcium with increasing age, and there is evidence to show that calcification in areas free of elastic tissue usually results from extension of areas of elastic tissue calcification.

The pattern of elastic tissue calcification differs in different arteries probably because of peculiar local influences. In the aorta it has been demonstrated that calcification first occurs in the elastic-tissue-rich media, while in the coronary it has been described as originating in the internal elastic lamella with extension subsequently into the intima and media. Elastic tissue calcification occurs relatively late in the hepatic artery and is also predominantly in the internal elastic lamella, although in this artery there is greater proliferation of the external elastic lamella with slight calcification than was seen in the coronary artery. In the renal artery it is the external elastic lamella which shows the most marked elastic tissue proliferation, fragmentation and calcification; the largest part of the medial calcification represents extension from the external elastic lamella. The problem of new formation of elastic tissue in aging arteries is also discussed.

A RELATIONSHIP OF MALENESS TO SHORTNESS OF THE LIFESPAN AND TO CERTAIN PATHOLOGICAL CONDITIONS. James B. Hamilton. *Department of Anatomy, Long Island College of Medicine, Brooklyn, N. Y.*

Males, in comparison with females, are susceptible to a greater number of pathological conditions which have a sex-differing incidence. In many instances the prognosis differs also in accordance with the sex of the patient. Discussion is given of a list of 365 of these conditions that occur in organs common to both sexes, that is, in tissues other than those of the reproductive organs. These pathological states include most of the major causes of death in humans, and are responsible in some large part for the occurrence of higher mortality rates in males than in females.

In the United States at present, mortality rates in males are so much higher than in females that the average lifespan of the male is five years shorter than that of the female. This disparity has become greater in recent times since males have been less able than females to take advantage of better living conditions and increasing opportunities for long life.

Such a lesser viability of males than of females characterizes most of the species of animals investigated thus far. The studies have been carried out in at least 70 species and include such diverse forms of life as nematodes, molluscs, crustaceans, insects, arachnids, birds, reptiles, fish, and mammals.

This warns against naive assumptions that the sex-differing temperaments, habits, or occupations of men and women account for the shorter lifespan of males than of females or for the tendency of a particular pathological condition to select one sex, unless one wishes to multiply the assumptions to fit hundreds of separate pathological states and even to extend some of them to many lower forms of life.

Data have been presented which pertain to the role of testicular secretions in physiological and pathological states, and are analyzed with the intention of ascertaining as far as now possible the extent to which testicular secretions and androgens may contribute to the lesser viability of males and to various of the male-selecting pathological conditions.

SOCIAL SCIENCES

THE SHOCK OF AGING. Martin Gumpert, *New York* 21, *N. Y.*

The realization that one is aging often occurs "over night" as the consequence of unforseen physical or emotional changes or failures, of unexpected social discrimination or rejection. Like death, the process of aging may be more feared and therefore more repressed than other unpleasant "facts of life". The unpreparedness for aging, the shock of growing older, is due to a lack of the training and guidance which we devote to other critical periods of life, like adolescence. The physician is often not well enough equipped for the rational treatment of the shock of aging as it appears in sudden cardiac failures, mental breakdowns, emotional unrest, loss of working capacity.

THE CHINESE ATTITUDE TOWARD OLD AGE. Albert R. Chandler. *Ohio State University, Columbus* 10, *Ohio.*

Chinese tradition includes high esteem for the aged. There are three reasons for this. (1) The family has been the strongest social unit, and the head of the family retains authority even after the sons have grown up. The basic virtue in Confucian ethics is filial piety. (2) In a static society, such as China was for more than 2000 years, cumulative experience is the chief source of wisdom, therefore the advice of the aged is sought and respected. (3) Chinese sages and poets have taught that happiness is to be found

in tranquility, moderation, family relationships, and aesthetic appreciation of the little things in life, therefore a healthy old age is considered the happiest phase of life. New conditions in China have somewhat weakened this tradition. In Western nations the increased numbers of aged and retired persons might lead to the adoption of some phases of the Chinese pattern.

COUNSELLING THE OLDER PERSON. GEORGE LAWTON. *New York, New York.*

Counselling of older persons proceeds in three stages. First is diagnosis, in which a study is made of the mental, emotional, social and creative resources of the individual. This follows the current procedures in clinical psychology with its emphasis on projective techniques and qualitative psychometric analysis. Part Two in counselling: rehabilitation, consists of an attempt to enrich these resources or remove the maladjustment within each of these four categories. While counselling is largely non-directive, one can be even less consistently non-directive with older persons than with younger ones. The final phase of counselling, and the most difficult, consists of finding in the community opportunities for the older man or woman to use his abilities and interests.

Those interested in the problem of older people may like to know that New York University since 1946 has offered two courses in counselling the older person, and that this field is now becoming a definite one, with its own techniques and procedures.

SOME FACTORS AFFECTING VOCABULARY SIZE IN LATER MATURITY: AGE. EDUCATION, AND LENGTH OF INSTITUTIONALIZATION. CHARLOTTE FOX AND JAMES E. BIRREN. *Section on Cardiovascular Diseases and Gerontology, National Institutes of Health, Bethesda, Maryland; and the Baltimore City Hospitals, Baltimore, Maryland.*

The vocabulary subtest of the Wechsler-Bellevue Test of Adult Intelligence and a revision of the English Recognition Vocabulary Test of Seashore and Eckerson were administered individually to 135 white men and 81 white women whose native language was English. The subjects had been institutionalized from less than 1 up to 18 years, in a home for the aged indigent. The mean age was 71.3 years, range 40-90 years; mean education was 6.0 years, range 0-15 years.

For this population there was no relation between vocabulary size and either length of institutionalization or age. There was a low positive correlation between vocabulary size and years of education (.38 for Wechsler and .34 for Seashore-Eckerson). The mean Seashore-Eckerson score was 14.0 words, representing an estimated total basic vocabulary of 24,600 words. The mean Wechsler vocabulary score was 18.0 words. The corrected split-half reliability of the Wechsler was .94 while that of the Seashore-Eckerson was .88. The correlation between the two tests was .82. Supplementary studies showed that sensory defects (vision and hearing) did not significantly affect measured vocabulary size, but persons with a foreign native language had significantly restricted vocabularies (mean Wechsler score was 9.0 words for foreign and 17.2 words for English native language groups of 29 persons each).

STATISTICAL PROBLEMS IN "CROSS-SECTIONAL" AGE DATA. BRONSON PRICE. *U. S. Children's Bureau, Washington, D. C.*

Selective biases and other factors affecting inferences drawn from age groups are discussed. Data from some of the earlier psychological studies are used to illustrate ways of estimating patterns of age change where different traits have been measured in different groups.

CHARACTER SKETCH COMPARISONS OF "SUCCESSFUL" AND "PROBLEM" OLD PEOPLE. ELIZABETH M. SIMCOE AND S. L. PRESSEY. *Ohio State University, Columbus, Ohio.*

The study has attempted to investigate characteristics of old people who were considered well adjusted and others who were problems, as reported in several hundred biographical sketches written by college students, after some consideration of case study methods and problems of adjustment in the older years. The great majority of these cases were members of the students' families and could be thought of as for the most part middle class, in possible contrast to individuals coming to attention because of receiving old age assistance or otherwise calling for attention by some outside agency.

Indicative either of status and adjustment in old age in such middle class groups, or attitudes of college students toward older individuals, was the finding that the large majority of the appraisals were highly friendly and that a considerable number of students reported they knew no old person who could be considered clearly a problem. A substantial number of individuals well past seventy were still vocationally active, and more were continuing their usefulness at least in the family or neighborhood. Hobbies, recreational interests, acquaintances in the neighborhood and community, and a cheerful disposition and efforts to be helpful were all common traits with the successful. Problem cases much more often showed a complaining or difficult disposition, lacked contacts outside the home, were not occupied in any way, and were in a community other than that in which their active life had been spent. Certain sample cases will be very briefly described.

PSYCHOLOGICAL IMPLICATIONS OF AGING IN AIRLINE PILOTS. ROSS A. MCFARLAND. *Harvard School of Public Health, Boston Massachusetts.*

The purpose of this study was to analyze changes with age in airline pilots as they relate to the requirements of their job. Representative samples of airmen, ranging in age from approximately 20 to 55 years and in number from approximately 200 to 7,000 were used. The data were collected through experimental studies and through statistical analyses of airline and CAA medical records. Frequency distributions were plotted against age and critical ratios determined for various groupings.

Results. The whispered voice test was found to be not a critical one because about 98% had normal hearing. Audiograms were therefore obtained for about 600 pilots. A progressive decline in auditory acuity was observed with age. These changes were then studied in relation to contemporary radio signal frequencies in most common use and to CAA and ICAO standards.

Studies were also made of changes in visual acuity and depth perception in different age groups. Although the alterations in acuity were quite large, they were of little significance in relation to the job even at the higher age levels. The same was true of depth perception. Significant differences in light sensitivity and serial reaction time were observed. The findings of these and other functions were evaluated in relation to the constantly changing job requirements.

Conclusions. Airmen comprise an interesting group for studying the aging process because of the significance of certain changes in relation to their duties. This study revealed that a pilot's fitness to fly depends more on his functional than on his chronological age. The functional age of pilots depends on their psychological and physiological status and is influenced by the combined effects of aging and the requirements of airline piloting. Present evidence indicates that 50 $\pm$ 5 years is the critical age level.

VISUAL ACUITY AS A FUNCTION OF AGE AND RETINAL AND MACULAR DEGENERATION. JAMES E. BIRREN AND MALCOLM W. BICK. *The Section on Cardiovascular Diseases and Gerontology, Nation-*

al Institutes of Health, Bethesda, Maryland, and the Baltimore City Hospitals, Baltimore, Maryland; Wilmer Ophthalmological Institute of Johns Hopkins Hospital and University, Baltimore, Maryland.

Visual acuity measurements were made on 107 subjects, age 40 to 83 years. In addition, ophthalmological examinations were made on each of the same subjects to determine the presence of macular and retinal degeneration.

Visual acuity was found to become poorer with age and was correlated with the degree of retinal and macular degeneration. The prevalence of these degenerative changes increased with age: only one out of 49 subjects beyond the age of 70 was free from such conditions. Of 11 subjects between the ages of 40-49, 3 gave evidence of some macular or retinal degeneration. The presence of each of these degenerative changes was found to correlate highly in the two eyes. The correlation between the right and left eyes for macular and for retinal degeneration was higher than the correlation between the two factors in the same eye.

SUPPORTIVE THERAPY IN GERIATRIC CASEWORK. RUTH LAVERTY. *Peabody Home for Aged Women, New York, New York.*

Aggressive behavior of residents in Homes for the Aged presents difficult problems to the administrative staff. The discussion points up the importance of recognizing that these manifestations are not always based on reality, but may be reactivated responses to earlier life experiences. One example of a continuation of childhood hostility is the sibling rivalry situation which becomes reactivated in an old age home whenever a new arrival is admitted since the Home and the staff have become the substitute family group for the residents. Therapeutic techniques similar to those in handling children's sibling rivalry problems can be used effectively.

Other forms of aggressive behavior commonly displayed by elderly people, whether directed towards the environment or towards themselves through illness, respond well to supportive therapy geared to rebuilding or sustaining ego strength to the point where they can again continue normal ego functioning. Two opposite types of cases with which supportive therapy is particularly effective, are those with well developed egos who are suffering from a temporary ego weakening because of severe environmental pressure, and the chronically anxious, dependent group with poorly developed egos.

Ways are suggested for diverting aggressive energy into constructive channels that are gratifying for the old people, and at the same time, helpful to the institutional staff.

OLD PEOPLE IN INDUSTRY. T. NORTH WHITEHEAD. *Cambridge, Mass.*

(No abstract received.)

CLINICAL MEDICINE

BASAL METABOLISM IN OLD AGE. WILLIAM B. KOUNTZ. *Division of Gerontology, Washington University School of Medicine, St. Louis.*

A constant and well known change in the aging body is a decline in rate of oxygen consumption. In a group of patients studied by us we have found that the decline varies in men and women and as well with the degree of degeneration of the body. When the degenerative changes reach the point that they cause disease there is, as a rule, a tendency for a rise in the rate of oxygen usage. From our studies we believe that the elevation in the rate of oxygen consumption is related to disturbance of physiological functions rather than to thyroid or perhaps other glandular activities.

An explanation of this consideration will be discussed.

GASTROENTEROLOGIC DISEASES IN THE ADVANCED DECADES OF LIFE. BURRILL B. CROHN. *Mount Sinai Hospital, New York, New York.*

Peptic ulcer is no longer considered a disease solely the problem of youth. Initial cases in the aged are not unusual. Cholelithiasis and cholecystitis present serious problems in advanced ages because of the surgical implications. Carcinoma in the aged diminishes in frequency, diminishes in intensity of progress, but increases in mortality as one attempts to apply the more rigorous surgical attack.

DISTINCTIVE FEATURES OF CORONARY DISEASE IN THE AGED. ERNST P. BOAS. *Mt. Sinai Hospital, New York, New York.*

The clinical picture of coronary artery disease in persons under the age of 50 differs from that of coronary disease in the older age groups. In the younger group men outnumber women in a ratio of about 4 to 1; after the age of 60 the ratio of incidence between men and women is as 2 to 1. In the young a family history of arterial disease is the rule, in the older groups it is less frequent. Disturbances of cholesterol metabolism appear particularly evident among the younger patients. In the young group pathological examination usually reveals that the coronary arteries and possibly the aorta are the only vessels with significant arteriosclerosis. Among the older patients the arteriosclerotic process tends to be widespread.

I would suggest as a working hypothesis that coronary artery sclerosis in the younger age groups results from a serious metabolic disorder which, for unknown reasons affects the coronary arteries primarily. In persons who develop symptoms of coronary artery disease late in life the metabolic disturbance is more indolent and the arteries of the heart are less susceptible to its noxious influence. In them involvement of the coronary arteries is but an accident in the evolution of the generalized arteriosclerosis.

RECENT DEVELOPMENTS IN VASCULAR OCCLUSIONS OF THE EXTREMITIES. FREDERIC W. BANCROFT. *New York Medical College, New York.*

(No abstract received)

FAVORABLE MENTAL DISORDERS IN THE ELDERLY. ROBERT BUSH MCGRAW. *Neurological Institute, New York, New York.*

In former years if a person beyond the age of 70 developed mental disturbances, manifested by abnormal behavior, disturbance of mood, abnormality of trend with delusions or alterations in the perceptive attributes such as questionable hallucinations, and also showed disturbance in memory, the prognosis was considered hopeless since the patient was assumed to be suffering from senile psychosis or marked cerebral arteriosclerosis. Recent experience has shown that many of the mental disturbances of the elderly are transitory in character, are dependent on emotional and environmental stresses or toxic conditions and that they are favorably influenced and treated in a great many instances. Temporary modification of the environment, attention to nutrition, to the control of infection, to the control of physiological functions, and the use of shock treatment in certain instances, are among the modalities which have been successful.

THE TECHNIC OF NUTRITIONAL THERAPY. MORTON S. BISKIND AND GERSON R. BISKIND. *New York, N. Y. and San Francisco, Calif.* (read by title).

Accumulating evidence emphasizes more and more the complexity of the nutritional needs of the animal organism. From the

few nutrients thought to be adequate for healthy cellular metabolism a generation ago, the number of factors known to be necessary has grown enormously. Clinical nutritional deficiency is always complex; lack of a single factor is impossible. Many failures in nutritional therapy (and even actual induction of new lesions) result from misapprehension as to the nature of the defect and the therapeutic use of single factors or mixtures of a few of them. Nutrients not yet isolated and identified are quite as important to life and health as those already known; hence, an adequate amount of a suitable natural source (e.g., liver) must be incorporated in the regime. To be satisfactory, therapy must be complete, intensive and persistent and all the essential nutrients must be administered simultaneously either orally alone, in divided doses with meals, or when absorption is impaired, orally and parenterally. Once all the lesions have healed, persons who have been deficient require indefinitely a maintenance dose from 5 to 10 or more times the normal maintenance amounts of the various vitamins. Recurrences are sooner or later invariable in these patients if they are maintained on diet alone.

THE GERONTOLOGICAL SOCIETY

GERONTOLOGICAL SOCIETY was organized and incorporated in 1945 in order to promote scientific studies of aging and to afford a common meeting ground for gerontologists representing various scientific fields, as well as those responsible for the care and treatment of the aged. The Society includes in its membership: physicians, physiologists, psychologists, anatomists, biochemists, sociologists, botanists, psychiatrists, Pharmacologists, geneticists, zoologists, endocrinologists, etc. Meetings of the Society are planned to afford opportunity for the exchange of ideas between research workers in various scientific fields who are interested in the study of gerontology.

The official publication of the Society is the JOURNAL OF GERONTOLOGY, edited by Dr. Robert A. Moore, Dean of the School of Medicine, Washington University, St. Louis, Mo. The Journal publishes articles on aging from all scientific fields. It also reviews pertinent topics in the field of aging. The first volume of the Journal was published in 1946 and may be found in most university and medical school libraries.

Membership in the Society may be applied for by anyone who is doing research on aging or who is engaged in some other aspect of gerontology. Application blanks may be obtained from the Secretary of the Society or from any of the individuals of the membership committee. Membership dues are $10 a year and include a subscription to the JOURNAL OF GERONTOLOGY. A check for this amount should be submitted with each application.

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MEMBERS

December 1, 1948

Aleck, Adolph W., Box 213, State College, Miss.
Allen, W. M., Washington University School of Medicine, St. Louis, Missouri
Amato, Louis L., 891 Post Road, Scarsdale, N. Y.
Andrew, Warren, George Washington University School of Medicine, Washington, D. C.
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Belt, Elmer, 1893 Wilshire Boulevard, Los Angeles, California
Benjamin, Harry, 728 Park Avenue, N. Y., N. Y.
Benton, Joseph G., Goldwater Memorial Hospital, New York, New York
Birren, James E., Baltimore City Hospitals, Baltimore, Maryland
Biskind, Gerson R., Mount Zion Hospital, San Francisco, California
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Boas, Ernst P., 1185 Park Avenue, N. Y., N. Y.
Bortz, Edward L., 2021 West Girard Avenue, Philadelphia, Pennsylvania
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Cannon Paul R., University of Chicago, Chicago, Illinois
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Chieffi, Margaret, Washington University School of Medicine, St. Louis, Missouri
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Crampton, C. Ward, 471 Park Avenue, N. Y., N. Y.
Crocker, W. M., Boyce Thompson Institute, Yonkers, New York
Daniels, George, 129 East 69th Street, N. Y., N. Y.
Davies, Dean F., Washington University School of Medicine, St. Louis, Missouri
Davis, Nathan S., 700 North Michigan Avenue, Chicago, Illinois
Desmond, Thomas C., 94 Broadway, Newburgh, New York
Doll, Edgar, Vineland, New Jersey
Draper, George, 630 West 168th Street, N. Y., N. Y.
Earle, Wilton R., National Cancer Institute, Bethesda, Maryland
Ellis, Thelma S., 70 North Water Street, Rochester, New York
Emery, Robert, 927 South Gramercy Place, Los Angeles, California
Engle, Earl T., 630 West 168th Street, N. Y., N. Y.
Erk, Vernon O., Box 559, Mobile, Alabama
Evans, Eluyn, 320 North Main Street, Orlando, Fla.
Eyerly, James B., 30 North Michigan Avenue, Chicago, Illinois
Farber, S., Childrens' Hospital, Boston, Mass.
Fauquhauson, R. F., 100 College Street, Toronto, Canada
Fischer, Robert P., Marietta College, Marietta, O.
Fleck, Warren L., United States Veterans' Hospital, Fort Howard, Maryland
Fox, Charlotte, Baltimore City Hospitals, Baltimore. Maryland
Fox, Flora, 45 Astor Place, New York, New York
Frank, Lawrence K., 72 Perry Street, N. Y., N. Y.
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Galdston, Morton, Goldwater Memorial Hospital, New York, New York
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George, J. T., 610 South Brodaway, Los Angeles, California
Gilbert, Jeanne G., 131 Joralemon Street, Brooklyn, New York
Gingery, Stanley W., Box 594, Newark, New Jersey
Goldblatt, Harry, Cedars of Lebanon Hospital, Los Angeles, California
Goldhamer, Morton L., 2010 East 102nd Street, Cleveland, Ohio
Goldzieher, Joseph W., 104 East 40th Street, New York, New York
Goldzieher, Max A., 104 East 40th Street, New York, New York
Goodman, Joseph I., 2010 East 102nd Street, Cleveland, Ohio
Greenspoon, E. A., Medical Arts Building, Montreal, Canada
Grossman, Ben, 6140 Drexel Boulevard, Chicago, Illinois
Gumpert, Martin, 728 Park Avenue, N. Y., N. Y.
Hamilton, James B., Long College of Medicine, Brooklyn, New York
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Hinds, Manuel E., Apt. 419, Guatemala, Central America
Hinman, Frank, 284 Post St., San Francisco, Cal.
Hisaw, F. L., Harvard University, Cambridge, Massachusetts
Holmes, Fred, 3rd & Mechanic Street, Lafayette, Indiana
Horrocks, John E., Ohio State University, Columbus, Ohio
Horvath, Steven M., University Hospital, Philadelphia, Pennsylvania
Hoskins, Roy G. 25 Shattuck Street, Boston, Mass.
Hotchkiss, Robert, 66th Street & Madison Avenue, New York, New York
Howell, Trevor H., 44 Highfield Road, Purley, Surrey, England
Howell, T. S., 706 8th Street, Bayton, Texas
Hubbard, L. Ronald, 10 West 72nd St., N. Y., N. Y.
Hueper, Wilhelm C., 113 West 18th St., N. Y., N. Y.
Isaac, Raphael, 104 South Michigan Avenue, Chicago, Illinois
Johnson, George E., 522 5th Avenue, N. Y., N. Y.
Jones, H. E., University of California, Berkeley, California
Kallmann, Franz J., New York State Psychiatric Institute, New York, New York
Kamin, Herman, 9 South Kedzie Avenue, Chicago, Illinois
Kaplan, Oscar J., San Diego State College, San Diego, California
Kauvar, S., University of Colorado School of Medicine, Denver, Colorado
Kehlmann, William H., 2449 Ocean Avenue, Brooklyn, New York
Kerr, William J., University of California Hospital, San Francisco, California
Kirk, Esben, 5344 Vernon Avenue, St. Louis, Mo.
Klumpp, Theodore G., 170 Varick St., N. Y., N. Y.
Kountz, William B., Infirmary Hospital, St. Louis, Missouri
Krag, Cletus, Washington University School of Medicine, St. Louis, Missouri
Kraus, Hertha, Bryn Mawr College, Bryn Mawr, Pennsylvania
Kuhlen, R. G., Syracuse University, Syracuse, N., Y.
Lansing, Albert, 507 South Euclid, St. Louis Mo.
Lanza, Anthony J., 1 Madison Avenue, N. Y., N. Y.
Lawrence, John H., University of California, Berkeley, California
Lawton, George, 41 West 82nd Street, N. Y., N. Y.
Leake, Chauncey D., University of Texas School of Medicine, Galveston, Texas
Lee, Roger I., 264 Beacon Street, Boston, Mass.
Lepak, John, St. Josephs Hospital, St. Paul, Minn.
Lew, Edward A., 1 Madison Avenue, N. Y., N. Y.
Lewis, William H., 135 East 64th St., N. Y., N. Y.
Lochhead, Charlotte, 24 West 69th St., N. Y., N. Y.
Lombardi, Alfonso A., 1 East 105th St., N. Y., N. Y.
Lorge, Irving, 525 West 120 St., N. Y., N. Y.
Lowry, Oliver H., Washington University School of Medicine, St. Louis, Missouri
Machle, Williard, 405 Lexington Ave., N. Y., N. Y.
MacNider, William deB., University of North Carolina School of Medicine, Chapel Hill, N. C.
Mainland, D., Dalhousie University, Halifax, N. S., Canada
Malamud, William, Worchester State Hospital, Worchester, Massachusetts
Maves, Paul B., LaGrangeville, New York
Maxwell, Catherine S., 520 Geary Avenue, San Francisco, California
McCay, C. M., Cornell University, Ithaca, N. Y.
McCullagh, Perry E., Cleveland Clinic, Cleveland, Ohio
McFarland, Ross A., Harvard University, Boston, Massachusetts
McGavack, Thomas, Fifth Avenue Hospital, New York, New York
Meyer, Jacob, 55 East Washington, Chicago, Ill.
Miles, Walter R., Yale University, New Haven, Connecticut
Miller, Fred D., 1122 12th Avenue, Altoona, Penn.
Monroe, Robert T., 270 Commonwealth Avenue, Boston, Massachusetts
Monteith, Stephen R., 75 North Broadway, Nyack, New York
Moore, Robert A., 507 South Euclid, St. Louis, Mo.
Myers, Victor C., Western Reserve University School of Medicine, Cleveland, Ohio
Necheles, Heinrich, Michael Reese Hospital, Chicago, Illinois
Newburger, Robert A., 20 East 76th St., N. Y., N. Y.
Noback, G. J., Cornell University Medical College, New York, New York
Norman, John F. 119 North Broadway, Crookston, Massachusetts
Nouges Ferero, Luis G., Bogota, Columbia, South America
Noyes, Helen, 122 East 22nd Street, N. Y., N. Y.
Oliver, Jean, 335 Henry Street, Brooklyn, N. Y.
Oppenheimer B. S., Mt. Sinai Hospital, N. Y., N. Y.
Overholser, Winifred, St. Elizabeth's Hospital, Washington, D. C.
Page, Henry, 2021 West Girard Avenue, Philadelphia, Pennsylvania
Page, Irvine H., Cleveland Clinic, Cleveland, Ohio
Perlman, Robert M., 999 Sutter Street, San Francisco, California
Piersol, George M., University Hospital, Philadelphia, Pennsylvania
Pijper, Adrianus, 57 Celliers Street, Pretoria, Union of South Africa
Pollak, Otto, Shornbrook Manor, Bryn Mawr, Penn.
Pottenger, Francis M., 635 South Westlale Avenue, Monrovia, California
Pratt, Joseph H., Joseph H. Pratt Diagnostic Hospital, Boston, Massachusetts
Pressey, Sidney L., Ohio State University, Columbus. Ohio
Ramsey, William A., Tyron Hospital, Tyron, N. C.
Randall, Ollie, 105 East 22nd Street, N. Y., N. Y.
Rathbun, Howard K., Baltimore City Hospitals, Baltimore, Maryland
Ravdin, Isidore S., University Hospital, Philadelphia, Pennsylvania
Rawls, W. B., 654 Madison Avenue, N. Y., N. Y.
Reymert, Martin L., Moosehart Laboratory for Child Research, Moosehart, Illinois
Riddle, Oscar, Route 4, Plant City, Flordia
Rioch, David, 500 West Montgomery Avenue, Rockville, Maryland
Robinson, Cortland O., 20 East 74th St., N. Y., N. Y.
Rones, Benjamin, 1610 Eye St., N.W., Wash., D. C.
Ropes, M. W., Massachusetts General Hospital, Boston Massachusetts
Rose, Benjamin (Institute) The, 1010 Rose Building, Cleveland, Ohio
Rothschild, David, Worchester State Hospital, Worchester, Massachusetts
Schroeder, Henry A., Barnes Hospital, St. Louis, Missouri
Sevringhaus, Elmer L., 59 Warren Place, Montclair, New Jersey
Shanklin, W. M., American University of Beirut School of Medicine, Beirut, Syria

Shelton, E. Kost, 921 Westwood Boulevard, Los Angeles, California
Shock, Nathan W., Baltimore City Hospitals, Baltimore, Maryland
Shorr, Ephraim, New York Hospital, N. Y., N. Y.
Simms, Henry S., 630 West 168St., N. Y., N. Y.
Sinclair, John G., University of Texas Medical School, Galveston, Texas
Singer, Charles, University College, London, Eng.
Siesinger, Donald, 12 East 86th St., N. Y., N. Y.
Smith, C. A. H., 350 Madison Avenue, N. Y., N. Y.
Sontag L. W., Antioch College, Yellow Springs, O.
Spencer, Roscoe R., National Cancer Institute, Bethesda, Maryland
Spies, Tom D., Hillman Hospital, Birmingham, Ala.
Sprague, Howard B., 270 Commonwealth Avenue, Boston, Massachusetts
Steele, J. Murray, Goldwater Memorial Hospital, New York, New York
Steindler, Arthur, University Hospital, Iowa City, Iowa
Steiner, Lee R., Queens College, Flushing, Long Island, New York
Sternberg, Fred, 13450 Cedar Road, Cleveland, O.
Stevens, Harold, St. Elizabeth's Hospital, Washington, D. C.
Stewart, Harold, New York Hospital, N. Y., N. Y.
Stieglitz, Edward J., 1727 Eye Street, N.W., Washington, D. C.
Stroud, William D., 1011 Clinton Street, Philadelphia, Pennsylvania
Talbott, John H., Buffalo General Hospital, Buffalo, New York
Terman, Lewis M., Stanford University, Stanford, California
Thompson, Kenneth W., Roche Park, Nutley, N. J.
Thompson, Willard O., 700 North Michigan Avenue, Chicago, Illinois
Tibbetts, Dorothy M., Massachusetts General Hospital, Boston, Massachusetts
Truex, Raymond C., 630 West 168th St., N. Y., N. Y.
Turner, Henry H., 1200 North Walker Street, Oklahoma City, Oklahoma
Val Dez, F. C., 30 North Michigan Boulevard, Chicago, Illinois
Van Slyke, C. J., National Heart Institute, Bethesda, Maryland
Wakefield, Howard, 5466 South Everett Avenue, Chicago, Illinois
Wallach, Kaufman, 41 West 96th St., N. Y., N. Y.
Warren, Stafford L., University of California, Los Angeles, California
Wechsler, David, 145 East 92nd St., N. Y., N. Y.
Weil, Julius, 3151 Mayfield Road, Cleveland, Ohio
White, Paul D., Massachusetts General Hospital, Boston, Massachusetts
Wierda, J. L., Univeristy of Pennsylvania, Philadelphia, Pennsylvania
Williams, R. H., Boston City Hospital, Boston, Massachusetts
Williamson, W. Rulon, F.S.A. Social Security Board, Washington, D. C.
Wislocki, George B., Harvard Medical School, Boston, Massachusetts
Woerner, Charles A., 101 Chestnut Street, Louisville, Kentucky
Wolfe, M., Albany Medical School, Albany, N. Y.
Wrisley, Gerald M., 315 14th St., Oakland, Cal.
Yeakel, Eleanor, 650 West 165th St., N. Y., N. Y.
Yellott, Mrs. Oscar, 1397 Corley Street, Beaumont, Texas
Zeman, Frederic D., 111 East 88th St., N. Y., N. Y.

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To add life to years, not just years to life

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